

L INTERPRETER

USER-S PAGE NO. 1 E0 S3

R0001 SECTION 1 DISPATCHER

R0002 ENTRY TO THE INTERPRETER. INTPRET SETS LOC TO THE FIRST INSTRUCTION, BANKSET TO THE BRANK OF THE
R0004 OBJECT INTERPRETIVE PROGRAM, AND INBIT15 TO THE BIT15 CONTENTS OF FBANK. INTERPRETIVE PROGRAMS MAY BE IN
R0006 VIRTUALLY ALL BANKS PRESENT UNDER ANY SUPER-BANK SETTING, WITH THE RESTRICTION THAT PROGRAMS IN HIGH BANKS
R0008 (BIT15 OF FBANK = 1) DO NOT REFER TO LOWBANKS, AND VICE-VERSA. THE INTERPRETER DOES NOT SWITCH SUPERBANKS.
R0010 E-BANK SWITCHING OCCURS WHENEVER GENERAL ERASABLE (100 - 3777) IS ADDRESSED.

0012 6006 BLOCK 03

0013 REF 1 COUNT 03/INTER

00135 6006 0 0003 1 INTPRET RELINT
0014 6007 0 0006 1 EXTEND
0015 REF 7 LAST 1075 6010 22 184 1 QXCH LOC SET LOC TO THE WORD FOLLOWING THE TC.

0016 REF 15 LAST 1075 6011 3 0006 1 +2 CA BRANK INTERPRETIVE BRANCHES FINISH HERE.
0017 REF 2 LAST 1075 6012 54 185 1 TS BANKSET
0018 REF 43 LAST 987 6013 7 4874 1 MASK BIT15 GET 15TH BIT FOR INDEXABLE ADDRESSES.
0019 REF 5 LAST 87 6014 54 115 0 TS INBIT15

0020 REF 8 LAST 1075 6015 54 023 1 TS EDOP MAKE SURE NO INSTRUCTIONS LEFT OVER

0021 REF 1 6016 1 6037 1 TCP NEWOPS PICK UP OP CODE PAIR AND BEGIN.
0022 REF 16 LAST 1077 6017 22 006 1 INTRSN LxCH BRANK RESUME SUSPENDED INTERPRETIVE JOB
0023 REF 228 LAST 891 6020 1 6011 0 TCP INTPRET +3

R0024 DLOAD LOADS MPAC, MPAC +1, LEAVING ZERO IN MPAC +2.

0025 6021 0 0006 1 DLOAD EXTEND
0026 REF 1 6022 5 0118 1 INDEX ADDRWD
0027 6023 3 0001 0 DCA 0 LOAD DP C(C(ADDRWD)) INTO MPAC,MPAX +1
0028 REF 289 LAST 891 6024 52 155 1 SLOAD2 DXCH MPAC
0029 REF 209 LAST 1071 6025 3 4714 1 CAP ZERO ZERO MPAC +2

USER-S PAGE NO. 2 E0 S3

+0 OP CODE IS EXIT.



L INTERPRETER

USER'S PAGE NO. 3 E0 S3

P0054 PROCESS ADDRESSES WHICH MAY BE DIRECT, INDEXED, OR REFERENCE THE PUSHDOWN LIST.

0056	REP	74	LAST 1059	6052	7 4712 0	ADDRESS	MASK	BIT1	SEE IF ADDRESS IS INDEXED. CYR CONTAINED
0057	REP	277	LAST 1078	6053	10 000 0	CCS	A		400XX, SO BIT 1 IS NOW AS IT WAS IN CYR.
0058	REP	1		6054	1 6115 0	TCP	INDEX		FORM INDEXED ADDRESS.
0059	REP	10	LAST 1076	6055	50 164 1	DIRADRES	INDEX	LOC	LOOK AHEAD TO NEXT WORD TO SEE IF
0060				6056	4 0001 1	OCT40001	CS	1	ADDRESS IS GIVEN.
0061	REP	278	LAST 1079	6057	10 000 0	CCS	A		
0062	REP	1		6060	1 6164 0	TCP	PUSHUP		IF NOT.
0063				6061	77773 1	NEG4	DEC	-4	
0084	REP	11	LAST 1079	6062	24 184 1	INCR	LOC		IF SO, TO SHOW WE PICKED UP A WORD.
0065	REP	2	LAST 1077	6063	54 116 0	TS	ADDRD		

L INTERPRETER

USER-S PAGE NO. 4 E0 S3

P0066 REQUIRED FINAL DIGESTION OF DIRECT ADDRESSES OF OP CODES WITH 01 PREFIX IS DONE HERE. IN EACH CASE, THE
 R0066 12-BIT SUB-ADDRESS IS LEFT IN ADDRWD, WITH ANY REQUIRED E OR F BANK SWITCHING DONE. ADDRESSES LESS
 R0070 THAN 450 ARE TAKEN TO BE RELATIVE TO THE WORK AREA. THE OP CODE IS NOW IN BITS 1-5 OF CYR WITH BIT 14 = 1.

0072	REF	1	6064	6	6220	1	AD	-ENDVAC	SEE IF ADDRESS RELATIVE TO WORK AREA.
0073	REF	279	LAST	1079	6065	10	000	0	CCS A
0074	REF	1	6066	6	7712	1	AD	-ENDERAS	IF NOT, SEE IF IN GENERAL ERASABLE.
0075	REF	1	6067	1	6074	0	TCF	IERASTST	
0076	REF	18	LAST	840	6070	3	0120	1	NETZERO CA FIXLOC
0077	REF	3	LAST	1079	6071	28	116	0	ADS ADDRWD
0078	REF	15	LAST	1078	6072	50	020	0	ITR15 INDEX CYR
0079	REF	1	6073	7	6242	1	7		INDJUMP -1
0080			6074	0	0006	1	IERASTST	EXTEND	
0081	REF	1	6075	6	6105	0	BZMP	GEADOR	GO PROCESS GENERAL-ERASABLE ADDRESS.
0082	REF	13	LAST	1075	6076	7	4747	0	MASK LOW10
0083	REF	14	LAST	1080	6077	6	4747	1	AD LOW10
0084	REF	4	LAST	1080	6100	56	116	1	XCH ADDRWD
0085	REF	6	LAST	1077	6101	6	0115	1	AD INTBIT15
0086	REF	11	LAST	1075	6102	54	004	1	TS FBANK
0087	REF	16	LAST	1080	6103	50	020	0	ITR12 INDEX CYR
0088	REF	2	LAST	1080	6104	7	6242	1	7 INDJUMP -1
0089	REF	8	LAST	1071	6105	7	4373	0	GEADOR MASK LOW8
0090	REF	3	LAST	372	6106	6	4744	1	AD OCT1400
0091	REF	5	LAST	1080	6107	56	116	1	XCH ADDRWD
0092	REF	46	LAST	1071	6110	54	003	0	TS FBANK
0093	REF	17	LAST	1080	6111	50	020	0	ITR10 INDEX CYR
0094	REF	3	LAST	1080	6112	7	6242	1	7 INDJUMP -1

IF SO, LEAVE THE MODIFIED ADDRESS IN ADDRWD AND DISPATCH.
 THIS INDEX MAKES THE NEXT INSTRUCTION TCF INDJUMP + OP, EDITING CYR.

FIXED BANK ADDRESS. RESTORE AND ADD B15.
 SWITCH BANKS AND LEAVE SUBADDRESS IN ADDRWD FOR OPERAND RETRIEVAL. (THIS METHOD PRECLUDES USE OF THE LAST LOCATION IN EACH FBANK.)

USER:8 PAGE NO. 5 E0 S3

0100	REF	1		6113	3 7702 0	DODLOAD* CAP	DLOAD*		STOOL* COMES HERE TO PROCESS LOAD ADR.
0101	REF	16	LAST 1080	6114	54 020 1	TS	CYR		(STOVL* ENTERS HERE).
0102	REF	19	LAST 1060	6115	3 0120 1	INDEX	CA	FIXLOC	SET UP INDEX LOCATION.
0103	REF	1		6116	54 130 1	TS		INDEXLOC	
0104	REF	12	LAST 1079	6117	24 184 1	INCR		LOC	(ADDRESS ALWAYS GIVEN).
0105	REF	13	LAST 1081	6120	50 184 1	INDEX		LOC	
0106				6121	4 0000 0	CS		0	
0107	REF	280	LAST 1080	6122	10 000 0	CCS		A	INDEX 2 IF ADDRESS STORED COMPLEMENTED.
0108	REF	2	LAST 1081	6123	24 130 0	INCR		INDEXLOC	
0109				6124	16 125 0	NOOP			
0110	REF	6	LAST 1080	6125	54 116 0	TS		ADDRWD	14 BIT ADDRESS TO ADDRWD.
0111	REF	2	LAST 129	6126	7 7711 0	MASK		HIGH4	IF ADDRESS GREATER THAN 2K, ADD INTBIT15
0112				6127	0 0008 1	EXTEND			
0113	REF	1		6130	1 6133 1	BZF		INDEX2	
0114	REF	7	LAST 1080	6131	3 0115 1	CA		INTBIT15	
0115	REF	7	LAST 1061	6132	26 116 0	ADS		ADDRWD	
0116	REF	3	LAST 1061	6133	50 130 0	INDEX2	INDEX	INDEXLOC	
0117	REF	46	LAST 662	6134	4 0046 1	CS		X1	
0118	REF	6	LAST 1061	6135	26 116 0	ADS		ADDRWD	DO AUGMENT, IGNORING AND CORRECTING OVP.
0119	REF	5	LAST 737	6136	7 7713 1	MASK		HIGH9	SEE IF ADDRESS IS IN WORK AREA.
0120				6137	0 0006 1	EXTEND			
0121	REF	1		6140	1 6153 1	BZF		INDWORK	
0122	REF	3	LAST 1081	6141	7 7711 0	MASK		HIGH4	SEE IF IN FIXED BANK.
0123				6142	0 0006 1	EXTEND			
0124	REF	1		6143	1 6155 1	BZF		INDERASE	
0125	REF	9	LAST 1081	6144	3 0116 1	CA		ADDRWD	IN FIXED - SWITCH BANKS AND CREATE
0126	REF	12	LAST 1080	6145	54 004 1	TS		FRANK	SUB-ADDRESS.
0127	REF	15	LAST 1060	6146	7 4747 0	MASK		LOW10	
0128	REF	1		6147	6 4700 1	AD		2K	
0129	REF	10	LAST 1081	6150	54 118 0	TS		ADDRWD	
0130	REF	19	LAST 1081	6151	50 020 0	1TR11	INDEX	CYR	
0131	REF	4	LAST 1080	6152	3 8242 0		3	INDJUMP -1	
0132	REF	20	LAST 1081	6153	3 0120 1	INDWORK	CA	FIXLOC	MAKE ADDRWD RELATIVE TO WORK AREA.
0133	REF	1		6154	1 6181 0		TCP	1TR13 -1	
0134	REF	4	LAST 1080	6155	3 4744 1	INDERASE	CA	OCT1400	
0135	REF	11	LAST 1081	6156	56 116 1		XCH	ADDRWD	
0136	REF	47	LAST 1080	6157	54 003 0		TS	ERANK	
0137	REF	9	LAST 1080	6160	7 4373 0		MASK	LOW8	
0138	REF	12	LAST 1081	6161	26 116 0	-1	ADS	ADDRWD	



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 20211111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1082

L INTERPRETER

USER'S PAGE NO. 6 E0 S3

0139	REF	20	LAST 1081	6162	50 020 0	ITR13	INDEX	CYR
0140	REF	5	LAST 1081	6163	3 6242 0		3	INDJUMP -1

L INTERPRETER

USER=3 PAGE NO. 7 E0 83

P0141 PUSH-UP ROUTINES. WHEN NO OPERAND ADDRESS IS GIVEN, THE APPROPRIATE OPERAND IS TAKEN FROM THE PUSH-DOWN
R0143 LIST. IN MOST CASES THE MODE OF THE RESULT (VECTOR OR SCALAR) OF THE LAST ARITHMETIC OPERATION PERFORMED
R0145 IS THE SAME AS THE TYPE OF OPERAND DESIRED (ALL ADD/SUBTRACT ETC.). EXCEPTIONS TO THIS GENERAL RULE ARE LISTED
R0147 BELOW (NOTE THAT IN EVERY CASE THE MODE REGISTER IS LEFT INTACT):

R0148 1. VXSC AND V/SC WANT THE OPPOSITE TYPE OF OPERAND, E.G., IF THE LAST OPERATION YIELDED A VECTOR
R0150 RESULT, VXSC WANTS A SCALAR.

R0151 2. THE LOAD CODES SHOULD LOAD THE ACCUMULATOR INDEPENDENT OF THE RESULT OF THE LAST OPERATION. THIS
R0153 INCLUDES VLOAD, DLOAD, TLOAD, PDDL, AND PDVL (NO PUSH-UP WITH SLOAD).

R0154 3. SOME ARITHMETIC OPERATIONS REQUIRE A STANDARD TYPE OF OPERAND REGARDLESS OF THE PREVIOUS OPERATION.
R0156 THIS INCLUDES SIGN WANTING DP AND TAD REQUIRING TP.

0157	REP	1		6164	3 4374 0	PUSHUP	CAP	OCT23		
0158	REP	21	LAST 1062	6165	7 0020 1		MASK	CYR		IF THE LOW 5 BITS OF CYR ARE LESS THAN
0159	REP	1		6166	6 6171 0		AD	-OCT10		20, THIS OP REQUIRES SPECIAL ATTENTION.
0160	REP	281	LAST 1081	6167	10 000 0		CCS	A		(NO -0).
0161	REP	1		6170	1 6202 0		TCF	REGUP		FOR ALL CODES GREATER THAN OCT 7.
0162				6171	77767 1	-OCT10	OCT	-10		
0163	REP	2	LAST 1020	6172	6 6081 0		AD	NEGA		
0164	REP	282	LAST 1083	6173	10 000 0		CCS	A		WE NOW HAVE 7 - OP CODE(MOD4). SEE IF
0165	REP	283	LAST 1083	6174	50 000 1		INDEX	A		THE OP CODE (MOD4) IS THREE (REVERSE).
0166	REP	1		6175	4 6213 0		CS	NO.WDS		NO - THE MODE IS DEFINITE. PICK UP THE
0167	REP	2	LAST 1063	6176	1 6204 0		TCF	REGUP +2		
0168	REP	5	LAST 1076	6177	50 163 0		INDEX	MODE		
0169	REP	1		6200	4 6211 1		CS	REVONT		FOR VXSC AND V/SC WE WANT THE REQUIRED
0170	REP	3	LAST 1063	6201	1 6204 0		TCF	REGUP +2		PUSHLOC DECREMENT WITHOUT CHANGING THE
0171	REP	6	LAST 1083	6202	50 163 0	REGUP	INDEX	MODE		MODE AT THIS TIME.
0172	REP	2	LAST 1063	6203	4 6213 0		CS	NO.WDS		
0173	REP	1		6204	26 166 1	+2	ADS	PUSHLOC		MOST ALL OP CODES PUSHUP HERE.
0174	REP	13	LAST 1081	6205	54 116 0		TS	ADDRWD		
0175	REP	22	LAST 1063	6206	50 020 0	ITR14	INDEX	CYR		
0176	REP	6	LAST 1062	6207	7 6242 1		7	INDJUMP -1		(THE INDEX MAKES THIS A TCF.)
0177				6210	00002 0		OCT	2		
0178				6211	00006 1	REVONT	OCT	6		REVERSE PUSHUP DECREMENT. VECTOR TAKES 2
0179				6212	00006 1		OCT	6		WORDS, SCALAR TAKES 6.
0180				6213	00002 0	NO.WDS	OCT	2		
0181				6214	00003 1	OCTAL3	OCT	3		CONVENTIONAL DECREMENT IS 6 WORDS VECTOR
0182				6215	00006 1		OCT	6		2 IN DP, AND 3 IN TP.



L INTERPRETER

USER'S PAGE NO. 8 E0 S3

P0183 TEST THE SECOND PREFIX BIT TO SEE IF THIS IS A MISCELLANEOUS OR A UNARY/SHORT SHIFT OPERATION.

0185	REF	23	LAST 1083	6216	10 020 1	OPJUMP2	CCS	CYR	TEST SECOND PREFIX BIT.
0186	REF	1		6217	1 6232 0	TCF	OPJUMP3		TEST THIRD BIT TO SEE IF UNARY OR SHIFT.
0187				6220	77722 0	-ENDVAC	DEC	-45	

R0188 THE FOLLOWING ROUTINE PROCESSES ADDRESSES OF SUFFIX CLASS 10. THEY ARE BASICALLY WORK AREA ADDRESSES
R0190 IN THE RANGE 0 - 52, ERASABLE ECADR CONSTANTS FROM 100 - 3777, AND FCADRS ABOVE THAT. ALL 15 BITS ARE AVAILABLE
R0192 IN CONTRAST TO SUFFIX 1, IN WHICH ONLY THE LOW ORDER 14 ARE AVAILABLE.

0193	REF	14	LAST 1081	6221	24 184 1	15BITADR	INCR	LOC	(ENTRY HERE FROM STCALL).
0194	REF	15	LAST 1084	6222	50 184 1		INDEX	LOC	PICK UP ADDRESS WORD.
0195				6223	3 0000 1		CA	0	
0198	REF	5	LAST 67	6224	54 117 1		TS	POLISH	WE MAY NEED A SUBADDRESS LATER.
0197	REF	1		6225	3 4750 1		CAP	LOW7+2K	THESE INSTRUCTIONS ARE IN BANK 1.
0198	REF	13	LAST 1081	6228	54 004 1		TS	FBANK	
0199	REF	24	LAST 1084	8227	7 0020 1		MASK	CYR	
0200	REF	284	LAST 1083	6230	50 000 1	ITRT	INDEX	A	
0201	REF	1		6231	1 6303 0		TCF	MISCAMP	



L INTERPRETER

USER=3 PAGE NO. 9 E0 S3

P0202 COMPLETE THE DISPATCHING OF UNARY AND SHORT SHIFT OPERATIONS.

0203	REP	14	LAST 1084	6232	54 004 1	OPJUMP3	TS	FRANK	CALL IN BANK 0 (BITS 11-15 OF A ARE 0.)
0204			ITRACE (6) REFERS TO 60PJUMP3A.						
0205	REP	25	LAST 1084	6233	10 020 1		CCS	CYR	TEST THIRD PREFIX BIT.
0206	REP	285	LAST 1084	6234	50 000 1		INDEX	A	THE DECREMENTED UNARY CODE IS IN BITS
0207	REP	1		6235	1 2000 1		TCP	UNAJUMP	1-4 OF A (ZERO, EXIT, HAS BEEN DETECTED)
0208	REP	7	LAST 1083	6236	10 163 1		CCS	MODE	ITS A SHORT SHIFT CODE. SEE IF PRESENT
0209	REP	1		6237	1 2017 1		TCP	SHORTT	SCALAR OR VECTOR.
0210	REP	2	LAST 1085	6240	1 2017 1		TCP	SHORTT	
0211	REP	1		6241	1 2121 0		TCP	SHORTV	
0212	REP	1		4384		FRANKMASK	EQUALS	BANKMASK	CALLS THE APPROPRIATE ROUTINE.
0213	REP	22	LAST 299	6242	00122 0	LVBUP	ADRES	VBUP	

L INTERPRETER

USBR#S PAGE NO. 10 E0 S3

P0214

THE FOLLOWING IS THE JUMP TABLE FOR OP CODES WHICH MAY HAVE INDEXABLE ADDRESSES OR MAY PUSH UP.

0216	REF	1	6243	1	6454	0	INDJMP	TCP	VLOAD	00 - LOAD MPAC WITH A VECTOR.
0217	REF	1	6244	1	7040	0		TCP	TAD	01 - TRIPLE PRECISION ADD TO MPAC.
0218	REF	1	6245	1	7624	1		TCP	SIGN	02 - COMPLEMENT MPAC (V OR SC) IF X NEG.
0219	REF	1	6246	1	7350	1		TCP	VXSC	03 - VECTOR TIMES SCALAR.
0220	REF	1	6247	1	6652	1		TCP	CGOTO	04 - COMPUTED GO TO.
0221	REF	2	6250	1	6437	0		TCP	TLOAD	05 - LOAD MPAC WITH TRIPLE PRECISION.
0222	REF	1	6251	1	6021	0		TCP	DLOAD	06 - LOAD MPAC WITH A DP SCALAR.
0223	REF	1	6252	1	7573	0		TCP	V/SC	07 - VECTOR DIVIDED BY SCALAR.
0224	REF	1	6253	1	6450	1		TCP	SLOAD	10 - LOAD MPAC IN SINGLE PRECISION.
0225	REF	1	6254	1	6567	1		TCP	SSP	11 - SET SINGLE PRECISION INTO X.
0226	REF	1	6255	1	6472	1		TCP	POOL	12 - PUSH DOWN MPAC AND RE-LOAD IN DP.
0227	REF	1	6256	1	7303	1		TCP	MXV	13 - MATRIX POST-MULTIPLIED BY VECTOR.
0228	REF	1	6257	1	6526	1		TCP	PDVL	14 - PUSH DOWN AND VECTOR LOAD.
0229	REF	1	6260	1	6575	1		TCP	CCALL	15 - COMPUTED CALL.
0230	REF	1	6261	1	7306	1		TCP	VCM	16 - MATRIX PRE-MULTIPLIED BY VECTOR.
0231	REF	1	6262	1	7565	1		TCP	TSLC	17 - NORMALIZE MPAC (SCALAR ONLY).
0232	REF	1	6263	1	7543	0		TCP	DMPR	20 - DP MULTIPLY AND ROUND.
0233	REF	1	6264	1	7548	0		TCP	DOV	21 - DP DIVIDE BY.
0234	REF	1	6265	1	7552	0		TCP	EDOV	22 - DP DIVIDE INTO.
0235	REF	1	6266	1	7570	0		TCP	GSHIFT	23 - GENERAL SHIFT INSTRUCTION.
0236	REF	1	6267	1	6720	0		TCP	VAD	24 - VECTOR ADD.
0237	REF	1	6270	1	6716	0		TCP	VSU	25 - VECTOR SUBTRACT.
0238	REF	1	6271	1	7005	1		TCP	BVSU	26 - VECTOR SUBTRACT FROM.
0239	REF	1	6272	1	7300	1		TCP	DOT	27 - VECTOR DOT PRODUCT.
0240	REF	1	6273	1	7427	0		TCP	VXV	30 - VECTOR CROSS PRODUCT.
0241	REF	1	6274	1	7374	1		TCP	VPROJ	31 - VECTOR PROJECTION.
0242	REF	1	6275	1	6754	0		TCP	DSU	32 - DP SUBTRACT.
0243	REF	1	6276	1	7031	0		TCP	EDSU	33 - DP SUBTRACT FROM.
0244	REF	1	6277	1	6744	1		TCP	DAD	34 - DP ADD.
0245	REF	1	6300	1	6300	0		TCP		35 - AVAILABLE
0246	REF	1	6301	1	7541	1		TCP	DMP1	36 - DP MULTIPLY.
0247	REF	1	6302	1	7562	0		TCP	SETPD	37 - SET PUSH DOWN POINTER (DIRECT ONLY)

R0248 CODES 10 AND 14 MUST NOT PUSH UP. CODE 04 MAY BE USED FOR VECTOR DECLARE BEFORE PUSH-UP IF DESIRED.



L INTERPRETER

USER-S PAGE NO. 11 E0 S3

P0250 THE FOLLOWING JUMP TABLE APPLIES TO INDEX, BRANCH, AND MISCELLANEOUS INSTRUCTIONS.

0252	REP	1	6303	1	2371	1	MISCJUMP	TCP	AXT	00 - ADDRESS TO INDEX TRUE.
0253	REP	1	6304	1	2376	0		TCP	AXC	01 - ADDRESS TO INDEX COMPLEMENTED.
0254	REP	1	6305	1	2401	1		TCP	LXA	02 - LOAD INDEX FROM ERASABLE.
0255	REP	1	6306	1	2405	0		TCP	LXC	03 - LOAD INDEX FROM COMPLEMENT OF ERAS.
0256	REP	1	6307	1	2411	0		TCP	SXA	04 - STORE INDEX IN ERASABLE.
0257	REP	1	6310	1	2417	0		TCP	XCHX	05 - EXCHANGE INDEX WITH ERASABLE.
0258	REP	1	6311	1	2433	0		TCP	INCR	06 - INCREMENT INDEX REGISTER.
0259	REP	1	6312	1	2442	0		TCP	TIX	07 - TRANSFER ON INDEX.
0260	REP	1	6313	1	2425	1		TCP	XAD	10 - INDEX REGISTER ADD FROM ERASABLE.
0261	REP	1	6314	1	2438	0		TCP	XSU	11 - INDEX SUBTRACT FROM ERASABLE.
0262	REP	1	6315	1	2514	1		TCP	BZE/GOTO	12 - BRANCH ZERO AND GOTO.
0263	REP	1	6316	1	2521	1		TCP	BPL/BMN	13 - BRANCH PLUS AND BRANCH MINUS.
0264	REP	1	6317	1	2474	0		TCP	RTB/BHIZ	14 - RETURN TO BASIC AND BRANCH HI ZERO.
0265	REP	1	6320	1	2534	0		TCP	CALL/ITA	15 - CALL AND STORE OPRET.
0266	REP	1	6321	1	2543	0		TCP	SW/	16 - SWITCH INSTRUCTIONS AND AVAILABLE.
0267	REP	1	6322	1	2504	0		TCP	BOV(B)	17 - BRANCH ON OVERFLOW TO BASIC OR INT.



L INTERPRETER

USER'S PAGE NO. 13 E0 S3

P0286 SECTION 2 LOAD AND STORE PACKAGE.

R0287 A SET OF EIGHT STORE CODES IS PROVIDED AS THE PRIMARY METHOD OF STORING THE MULTI-PURPOSE
R0289 ACCUMULATOR (MPAC). IF IN THE DANZIG SECTION LOC EXPERS TO AN ALGEBRAICALLY POSITIVE WORD, IT IS TAKEN AS A
R0291 STORE CODE WITH A CORRESPONDING ERASABLE ADDRESS. MOST OF THESE CODES ARE TWO ADDRESS, SPECIFYING THAT THE WORD
R0293 FOLLOWING THE STORE CODE IS TO BE USED AS AN ADDRESS FROM WHICH TO RE-LOAD MPAC. FOUR OPTIONS ARE AVAILABLE:

- | | | |
|-------|-----------|--|
| R0295 | 1. STORE | STORE MPAC. THE E ADDRESS MAY BE INDEXED. |
| R0297 | 2. STODL | STORE MPAC AND RE-LOAD IT IN DP WITH THE NEXT ADDRESS (THE LOAD MAY BE INDEXED). |
| R0299 | 3. STOVL | STORE MPAC AND RE-LOAD A VECTOR (AS ABOVE). |
| R0301 | 4. STCALL | STORE AND DO A CALL (BOTH ADDRESSES MUST BE DIRECT HERE). |

R0303 STODL AND STOVL WILL TAKE FROM THE PUSH-DOWN LIST IF NO LOAD ADDRESS IS GIVEN.

0305 6323 BLOCK 3

0306 REF 2 LAST I077 TO I088' 205 205* COUNT 03/INTER

0307	REF	4	LAST 1078	6323	3 0165 0	STADR	CA	BANKSET	THE STADR CODE (PUSHUP UP ON STORE ADDRESS) ENTERS HERE.
0308	REF	15	LAST 1085	6324	54 004 1		TS	FRANK	
0309	REF	16	LAST 1084	6325	24 164 1		INCR	LOC	
0310	REF	17	LAST 1089	6328	50 184 1	ITR1	INDEX	LOC	THE STORECODE WAS STORED COMPLEMENTED TO MAKE IT LOOK LIKE AN OPCODE PAIR. (YOU CANT REMOVE 1 BECAUSE OF EARLY CCS)
0311				6327	4 0000 0		CS	0	
0312	REF	23	LAST 1089	6330	6 7716 0		AD	NEGONE	
0313	REF	14	LAST 1083	6331	54 116 0	DOSTORE	TS	ADDRMD	ENTRY FROM DISPATCHER. SAVE THE ERASABLE ADDRESS AND JUMP ON THE STORE CODE NO.
0314	REF	7	LAST 373	6332	7 4372 1		MASK	LOW11	
0315	REF	15	LAST 1089	6333	56 116 1		XCH	ADDRMD	
0316	REF	1		6334	7 7671 1		MASK	B12T14	EACH TRANSFER VECTOR ENTRY IS TWO WORDS.
0317				6335	0 0008 1		EXTEND		
0318	REF	38	LAST 1013	6336	7 4708 0		MP	BITS	
0319	REF	288	LAST 1085	6337	50 000 1	ITRO	INDEX	A	
0320	REF	1		6340	1 6341 0		TCP	STORJUMP	

L INTERPRETER

USER'S PAGE NO. 14 E0 S3

P0321 STORE CODE JUMP TABLE. CALLS THE APPROPRIATE STORING ROUTINE AND EXITS TO DANZIG OR TO ADDRESS WITH
R0323 A SUPPLIED OPERATION CODE.

R03231 STORE STORE,1 AND STORE,2 RETURN TO DANZIG, THUS RESETTING THE BRANK TO ITS STATE AT INTPRET.

0324	REP	1		0341	0	0371	1	STORJUMP	TC	STORE	STORE.
0325	REP	9	LAST 754	0342	1	0030	0		TCP	DANZIG	PICK UP NEW OP CODE(S).
0326	REP	1		0343	0	0363	1		TC	STORE,1	
0327	REP	10	LAST 1090	0344	1	0030	0		TCP	DANZIG	
0328	REP	1		0345	0	0366	1		TC	STORE,2	
0329	REP	11	LAST 1090	0346	1	0030	0		TCP	DANZIG	
0330	REP	2	LAST 1090	0347	0	0371	1		TC	STORE	STOVL.
0331	REP	1		0350	1	0427	1		TCP	DOLOAD	
0332	REP	3	LAST 1090	0351	0	0371	1		TC	STORE	STOVL WITH INDEXED LOAD ADDRESS.
0333	REP	1		0352	1	0113	0		TCP	DOLOAD*	
0334	REP	4	LAST 1090	0353	0	0371	1		TC	STORE	STOVL.
0335	REP	1		0354	1	0432	0		TCP	DOVLOAD	
0336	REP	5	LAST 1090	0355	0	0371	1		TC	STORE	STOVL WITH INDEXED LOAD ADDRESS.
0337	REP	1		0356	1	0435	1		TCP	DOVLOAD*	
0338	REP	6	LAST 1090	0357	0	0371	1		TC	STORE	STOVL.
0339	REP	1		0360	3	4723	0		CAP	CALLCODE	
0340	REP	26	LAST 1085	0361	54	020	1		TS	CYR	
0341	REP	1		0362	1	0221	1		TCP	15BITADR	GET A 15 BIT ADDRESS.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1091

L INTERPRETER

USER'S PAGE NO. 15 E0 S3

P0342 STORE CODE ADDRESS PROCESSOR.

0343	REP	21	LAST	1081	6363	50	120	1	STORE,1	INDEX	PIXLOC
0344	REP	49	LAST	1081	6364	4	0046	1		CS	X1
0345	REP	1			6365	1	6370	1		TCP	PRESTORE
0346	REP	22	LAST	1091	6366	50	120	1	STORE,2	INDEX	PIXLOC
0347	REP	26	LAST	890	6367	4	0047	0		CS	X2
0348	REP	16	LAST	1089	6370	28	116	0	PRESTORE	ADS	ADDRWD
0349	REP	17	LAST	1091	6371	4	0116	0	STORE	CS	ADDRWD
0350	REP	2	LAST	941	6372	6	4727	1		AD	DEC45
0351	REP	287	LAST	1089	6373	10	000	0		CCS	A
0352	REP	23	LAST	1091	6374	3	0120	1		CA	PIXLOC
0353	REP	1			6375	1	6402	0		TCP	AHEAD5
0354	REP	5	LAST	1081	6376	3	4744	1		CA	OCT1400
0355	REP	18	LAST	1091	6377	56	116	1		XCH	ADDRWD
0356	REP	48	LAST	1081	6400	54	003	0		TS	ERANK
0357	REP	10	LAST	1081	6401	7	4373	0		MASK	LOW8
0358	REP	19	LAST	1091	6402	28	116	0	AHEAD5	ADS	ADDRWD

RESULTANT ADDRESS IS IN ERASABLE.

DOES THE ADDRESS POINT TO THE WORK AREA?
YES.

NO. SET ERANK d MAKE UP SUBADDRESS.



L INTERPRETER

USER'S PAGE NO. 10 E0 53

P0359 SENDING ROUTINES. STORE DP, TP, OR VECTOR AS INDICATED BY MODE.

0360 6403 0 0006 1 STARTSTO EXTEND MPAC,+1 MUST BE STORED IN ANY EVENT.
R0361 INSURE (S) REFERS TO ASTARTSTO.
0362 REF 291 (LAST 1078 6404 3 0155 0 DCA MPAC
0363 REF 20 (LAST 1091 6405 50 116 1 INDEX ADDRWD
0364 6406 52 001 1 DXCH 0

0365 REF 8 (LAST 1085 6407 10 163 1 CCS MODE
0366 REF 1 6410 1 6423 0 TCF TSTORE
0367 REF 229 (LAST 1078 6411 0 0002 0 TC 0

0368 6412 0 0006 1 VSTORE EXTEND
0369 REF 292 (LAST 1092 6413 3 0160 0 DCA MPAC +3
0370 REF 21 (LAST 1092 6414 50 116 1 INDEX ADDRWD
0371 6415 52 003 0 DXCH 2

0372 6416 0 0006 1 EXTEND
0373 REF 293 (LAST 1092 6417 3 0162 1 DCA MPAC +5
0374 REF 22 (LAST 1092 6420 50 116 1 INDEX ADDRWD
0375 6421 52 005 0 DXCH 4
0376 REF 230 (LAST 1092 6422 0 0002 0 TC 0

0377 REF 294 (LAST 1092 6423 3 0156 0 TSTORE CA MPAC +2
0378 REF 23 (LAST 1092 6424 50 116 1 INDEX ADDRWD
0379 6425 54 002 1 TS 2
0380 REF 231 (LAST 1092 6426 0 0002 0 TC 0



L INTERPRETER

USER=8 PAGE NO. 17 E0 93

P0381 ROUTINES TO BEGIN PROCESSING OF THE SECOND ADDRESS ASSOCIATED WITH ALL STORE-TYPE CODES EXCEPT STORE
R0383 ITSELF.

0384	REP	1		6427	3 7701 0	DODLOAD	CAP	DLOADCOD	
0385	REP	27	LAST 1090	6430	54 020 1		TS	CYR	
0386	REP	1		6431	1 6055 0		TCP	DIRADRES	GO GET A DIRECT ADDRESS.
0387	REP	1		6432	3 4874 0	DOVLOAD	CAP	VLOADCOD	
0388	REP	28	LAST 1093	6433	54 020 1		TS	CYR	
0389	REP	2	LAST 1093	6434	1 6055 0		TCP	DIRADRES	
0390	REP	1		6435	3 6056 1	DOVLOAD*	CAP	VLOAD*	
0391	REP	2	LAST 1090	6436	1 6114 1		TCP	DODLOAD* +1	PROLOGUE TO INDEX ROUTINE.

L INTERPRETER

USER=8 PAGE NO. 16 E0 S3

P0392

THE FOLLOWING LOAD INSTRUCTIONS ARE PROVIDED FOR LOADING THE MULTI-PURPOSE ACCUMULATOR MPAC.

0394	REP 24	LAST 1092	6437	50 116 1	TLOAD	INDEX	ADDRWD	
0395			6440	3 0002 0		CA	2	
0396	REP 295	LAST 1092	6441	54 156 1		TS	MPAC +2	
0397			6442	0 0006 1		EXTEND		
0398	REP 25	LAST 1094	6443	5 0116 1		INDEX	ADDRWD	
0399			6444	3 0001 0		DCA	0	
0400	REP 296	LAST 1094	6445	52 155 1		DXCH	MPAC	
0401	REP 133	LAST 1058	6446	3 4712 1	TMODE	CAP	ONE	
0402	REP 1		6447	1 6027 0		TCP	NEWMODE	
0403			6450	22 007 0	SLOAD	ZL		
0404	REP 28	LAST 1094	6451	50 116 1		INDEX	ADDRWD	
0405			6452	3 0000 1		CA	0	
0406	REP 1		6453	1 6024 0		TCP	SLOAD2	
0407			6454	0 0006 1	VLOAD	EXTEND		
0408	REP 27	LAST 1094	6455	5 0116 1		INDEX	ADDRWD	
0409			6456	3 0001 0		DCA	0	
0410	REP 297	LAST 1094	6457	52 155 1		DXCH	MPAC	
0411			6460	0 0006 1	ENDVLOAD	EXTEND		
0412	REP 28	LAST 1094	6461	5 0116 1		INDEX	ADDRWD	
0413			6462	3 0003 1		DCA	2	
0414	REP 298	LAST 1094	6463	52 160 1		DXCH	MPAC +3	
0415			6464	0 0006 1	+4	EXTEND		
0416	REP 29	LAST 1094	6465	5 0116 1		INDEX	ADDRWD	
0417			6466	3 0005 1		DCA	4	
0418	REP 299	LAST 1094	6467	52 162 0		DXCH	MPAC +5	
0419	REP 134	LAST 1094	6470	4 4712 0	VMODE	CS	ONE	
0420	REP 2	LAST 1094	6471	1 6027 0		TCP	NEWMODE	

LOAD A TRIPLE PRECISION ARGUMENT INTO THE FIRST THREE MPAC REGISTERS, WITH THE CONTENTS OF THE OTHER FOUR IRRELEVANT.

DECLARE TRIPLE PRECISION MODE.

LOAD A SINGLE PRECISION NUMBER INTO MPAC, SETTING MPAC+1,2 TO ZERO. THE CONTENTS OF THE REMAINING MPAC REGISTERS ARE IRRELEVANT.

LOAD A DOUBLE PRECISION VECTOR INTO MPAC,+1, MPAC+3,4, AND MPAC+5,6. THE CONTENTS OF MPAC +2 ARE IRRELEVANT.

PDVL COMES HERE TO FINISH UP FOR DP, TP.

TPDVL FINISHES HERE.

DECLARE VECTOR MODE.



L INTERPRETER

USER=3 PAGE NO. 19 EQ 83

P0421 THE FOLLOWING INSTRUCTIONS ARE PROVIDED FOR STORING OPERANDS IN THE PUSHDOWN LIST'

R0423 1. PUSH PUSHDOWN AND NO LOAD.
R0424 2. PDDL PUSHDOWN AND DOUBLE PRECISION LOAD.
R0425 3. PDVL PUSHDOWN AND VECTOR LOAD.

0426			6472	0 0006 1	PDDL	EXTEND		
0427	REP 30	LAST 1094	6473	5 0116 1		INDEX	ADDRWD	LOAD MPAC,+1, PUSHING THE FORMER
0428			6474	3 0001 0		DCA	0	CONTENTS DOWN.
0429	REP 300	LAST 1094	6475	52 155 1		DXCH	MPAC	
0430	REP 2	LAST 1083	6476	50 166 0		INDEX	PUSHLOC	
0431			6477	52 001 1		DXCH	0	
0432	REP 9	LAST 1092	6500	50 163 0		INDEX	MODE	ADVANCE THE PUSHDOWN POINTER APPRO-
0433	REP 3	LAST 1083	6501	3 6213 1		CAP	NO.WDS	PRIATELY.
0434	REP 3	LAST 1095	6502	26 166 1		ADS	PUSHLOC	
0435	REP 10	LAST 1095	6503	10 163 1		CCS	MODE	
0436	REP 1		6504	1 6521 0		TCF	ENDPUSH	
0437	REP 1		6505	1 6517 0		TCF	ENDPUSH	
0438	REP 11	LAST 1095	6506	54 163 1		TS	MODE	NOW DP.
0439	REP 301	LAST 1095	6507	54 156 1	ENDVPUSH	TS	MPAC +2	
0440	REP 302	LAST 1095	6510	52 160 1		DXCH	MPAC +3	PUSH DOWN THE REST OF THE VECTOR HERE.
0441	REP 4	LAST 1095	6511	50 166 0		INDEX	PUSHLOC	
0442			6512	51-775 0		DXCH	0 -4	
0443	REP 303	LAST 1095	6513	52 162 0		DXCH	MPAC +5	
0444	REP 5	LAST 1095	6514	50 166 0		INDEX	PUSHLOC	
0445			6515	51-777 1		DXCH	0 -2	
0446	REP 12	LAST 1090	6516	1 6030 0		TCF	DANZIG	
0447	REP 304	LAST 1095	6517	54 156 1	ENDDPUSH	TS	MPAC +2	SET MPAC +2 TO ZERO AND EXIT ON DP.
0448	REP 13	LAST 1095	6520	1 6030 0		TCF	DANZIG	
0449	REP 12	LAST 1095	6521	54 163 1	ENDVPUSH	TS	MODE	
0450	REP 305	LAST 1095	6522	56 156 0		XCH	MPAC +2	ON TRIPLE, SET MPAC +2 TO ZERO, PUSHING
0451	REP 6	LAST 1095	6523	50 166 0	+2	INDEX	PUSHLOC	DOWN THE OLD CONTENTS
0452			6524	53-777 0		TS	0 -1	
0453	REP 14	LAST 1095	6525	1 6030 0		TCF	DANZIG	

L INTERPRETER

USER=5 PAGE NO. 20 E0 S3

P0454 PDVL - PUSHDOWN AND VECTOR LOAD.

0455			6526	0 0006 1	PDVL	EXTEND		RELOAD MPAC AND PUSH DOWN ITS CONTENTS.
0456	REF 31	LAST 1095	6527	5 0116 1		INDEX	ADDRWD	
0457			6530	3 0001 0		DCA	0	
0458	REF 306	LAST 1095	6531	52 155 1		DXCH	MPAC	
0459	REF 7	LAST 1095	6532	50 166 0		INDEX	PUSHLOC	
0460			6533	52 001 1		DXCH	0	
0461	REF 13	LAST 1095	6534	50 163 0		INDEX	MODE	ADVANCE THE PUSHDOWN POINTER.
0462	REF 4	LAST 1095	6535	3 6213 1		CAP	NO.WDS	
0463	REF 8	LAST 1096	6536	26 166 1		ADS	PUSHLOC	
0464	REF 14	LAST 1096	6537	10 163 1		CCS	MODE	TEST PAST MODE.
0465	REF 1		6540	1 6557 1		TOP	TPDVL	
0466	REF 1		6541	1 6460 1		TOP	ENDVLOAD	JUST LOAD LAST FOUR REGISTERS ON DP.
0467			6542	0 0006 1	VPDVL	EXTEND		PUSHDOWN AND RE-LOAD LAST TWO COMPONENTS
0468	REF 32	LAST 1096	6543	5 0116 1		INDEX	ADDRWD	
0469			6544	3 0003 1		DCA	2	
0470	REF 307	LAST 1096	6545	52 160 1		DXCH	MPAC +3	
0471	REF 9	LAST 1096	6546	50 166 0		INDEX	PUSHLOC	
0472			6547	51-775 0		DXCH	0 -4	
0473			6550	0 0006 1		EXTEND		
0474	REF 33	LAST 1096	6551	5 0116 1		INDEX	ADDRWD	
0475			6552	3 0005 1		DCA	4	
0476	REF 308	LAST 1096	6553	52 162 0		DXCH	MPAC +5	
0477	REF 10	LAST 1096	6554	50 166 0		INDEX	PUSHLOC	
0478			6555	51-777 1		DXCH	0 -2	
0479	REF 15	LAST 1095	6556	1 6030 0		TOP	DANZIG	
0480			6557	0 0006 1	TPDVL	EXTEND		ON TP, WE MUST LOAD THE Y COMPONENT
0481	REF 34	LAST 1096	6560	5 0116 1		INDEX	ADDRWD	BEFORE STORING MPAC +2 IN CASE THIS IS A
0482			6561	3 0003 1		DCA	2	PUSHUP.
0483	REF 309	LAST 1096	6562	52 160 1		DXCH	MPAC +3	
0484	REF 310	LAST 1096	6563	3 0156 0		CA	MPAC +2	
0485	REF 11	LAST 1096	6564	50 166 0		INDEX	PUSHLOC	IN DP.
0486			6565	53-777 0		TS	0 -1	
0487	REF 2	LAST 1096	6566	1 6464 0		TOP	ENDVLOAD +4	

R0488 SSP (STORE SINGLE PRECISION) IS EXECUTED HERE.

0489	REF 18	LAST 1089	6567	24 164 1	SSP	INCR	LOC	PICK UP THE WORD FOLLOWING THE GIVEN
0490	REF 19	LAST 1096	6570	50 164 1		INDEX	LOC	ADDRESS AND STORE IT AT X.
0491			6571	3 0000 1		CA	0	
0492	REF 35	LAST 1096	6572	50 116 1	STORE1	INDEX	ADDRWD	SOME INDEX AND MISCELLANEOUS OPS END
0493			6573	54 000 0		TS	0	HERE.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1097

L INTERPRETER

USER'S PAGE NO. 21 E0 S3

0494 RSP 16 LAST 1086

6574 1 6030 0

TCP DANZIG

L INTERPRETER

USER=8 PAGE NO. 22 E0 83

P0495 SEQUENCE CHANGING AND SUBROUTINE CALLING OPTIONS.

R0496 THE FOLLOWING OPERATIONS ARE AVAILABLE FOR SEQUENCING CHANGING, BRANCHING, AND CALLING SUBROUTINES:

R0496	1.	GOTO	GO TO.
R0499	2.	CALL	CALL SUBROUTINE SETTING QPRET.
R0500	3.	CGOTO	COMPUTED GO TO.
R0501	4.	CCALL	COMPUTED CALL.
R0502	7.	BPL	BRANCH IF MPAC POSITIVE OR ZERO.
R0503	8.	BZE	BRANCH IF MPAC ZERO.
R0504	9.	BNN	BRANCH IF MPAC NEGATIVE NON-ZERO.

0505	REP	20	LAST 1096	6575	24 184 1	CCALL	INCR	LOC	MAINTAIN LOC FOR QPRET COMPUTATION.
0506	REP	21	LAST 1096	6576	50 164 1		INDEX	LOC	
0507				6577	3 0000 1		CAP	0	GET BASE ADDRESS OF CADR LIST.
0508	REP	36	LAST 1096	6600	50 118 1		INDEX	ADDRESS	
0509				6601	6 0000 1		AD	0	ADD INCREMENT.
0510	REP	16	LAST 1069	6602	54 004 1		TS	FBANK	SELECT DESIRED CADR.
0511	REP	16	LAST 1061	6603	7 4747 0		MASK	LOW10	
0512	REP	286	LAST 1091	6604	50 000 1		INDEX	A	
0513				6605	3 2000 0		CAP	10000	
0514	REP	6	LAST 1084	6606	54 117 1		TS	POLISH	
0515	REP	5	LAST 1089	6607	3 0165 0	CALL	CA	BANKSET	FOR ANY OF THE CALL OPTIONS, MAKE UP THE
0516	REP	2	LAST 1085	6610	7 4384 0		MASK	BANKMASK	ADDRESS OF THE NEXT OP-CODE PAIR/STORE
0517	REP	3	LAST 1098	6611	8 4384 1		AD	BANKMASK	CODE AND LEAVE IT IN QPRET. NOTE THAT
0518	REP	22	LAST 1098	6612	8 0184 1		AD	LOC	BANKMASK = -(2000 - 1).
0519	REP	24	LAST 1091	6613	50 120 1		INDEX	FIXLOC	
0520	REP	17	LAST 748	6614	54 052 1		TS	QPRET	
0521	REP	7	LAST 1096	6615	3 0117 0	GOTO	CA	POLISH	BASIC BRANCHING SEQUENCE.
0522	REP	4	LAST 1061	6616	7 7711 0	+1	MASK	HIGH4	
0523				6617	0 0006 1		EXTEND		
0524	REP	1		6620	1 6831 1		BZF	GOTOERS	SEE IF ADDRESS POINTS TO FIXED OR ERAS.
0525	REP	6	LAST 1098	6621	3 0185 0	+4	CA	BANKSET	SET FBANK PART OF FBANK. NEXT, SET UP
0526	REP	16	LAST 1078	6622	54 006 0		TS	FBANK	FBANK. THE COMBINATION IS PICKED UP d
0527	REP	8	LAST 1098	6623	3 0117 0		CA	POLISH	PUT INTO BANKSET AT INTPRET +2.
0528	REP	17	LAST 1098	6624	54 004 1		TS	FBANK	
0529	REP	17	LAST 1098	6625	7 4747 0		MASK	LOW10	
0530	REP	2	LAST 1081	6626	6 4700 1		AD	ZK	
0531	REP	23	LAST 1098	6627	54 164 0		TS	LOC	
0532	REP	227	LAST 1077	6630	1 6011 0		TCP	INTPRET +3	

0533 E3,1400

FBANK= 1400

SO YOU DON'T CUSS THE ACA 1400s BELOW.

0534	REP	9	LAST 1098	6631	3 0117 0	GOTOERS	CA	POLISH
0535	REP	2	LAST 1080	6632	6 6220 1		AD	-ENDVAC
0536	REP	289	LAST 1096	6633	10 000 0		CCS	A
0537	REP	10	LAST 1096	6634	3 0117 0		CA	POLISH
0538	REP	1		6635	1 6644 0		TCP	GOTOGE

THE GIVEN ADDRESS IS IN ERASABLE - SEE IF RELATIVE TO THE WORK AREA.

GENERAL ERASABLE.



L INTERPRETER

0539	REP	25	LAST 1096	6636	3 0120 1	CA	FIXLOC
0540	REP	11	LAST 1096	6637	6 0117 0	AD	POLISH
0541	REP	290	LAST 1096	6640	50 000 1	INDEX	A
0542				6641	3 0000 1	CA	0
0543	REP	12	LAST 1099	6642	54 117 1	TS	POLISH
0544	REP	1		6643	1 6616 1	TCP	GOTO +1
0545	REP	49	LAST 1091	6644	54 003 0	GOTOGE	TS FBANK
0546	REP	11	LAST 1091	6645	7 4373 0	MASK	LOW6
0547	REP	291	LAST 1099	6646	50 000 1	INDEX	A
0548				6647	3 1400 1	CA	1400
0549	REP	13	LAST 1099	6650	54 117 1	TS	POLISH
0550	REP	2	LAST 1099	6651	1 6616 1	TCP	GOTO +1
0551	REP	24	LAST 1096	6652	50 164 1	CGOTO	INDEX LOC
0552				6653	3 0001 0	CA	1
0553	REP	37	LAST 1096	6654	50 116 1	INDEX	ADDRWD
0554				6655	6 0000 1	AD	0
0555	REP	16	LAST 1098	6656	54 004 1	TS	FBANK
0556	REP	16	LAST 1098	6657	7 4747 0	MASK	LOW10
0557	REP	292	LAST 1099	6660	50 000 1	INDEX	A
0558				6661	3 2000 0	CA	10000
0559	REP	14	LAST 1099	6662	54 117 1	TS	POLISH
0560	REP	3	LAST 1099	6663	1 6616 1	TCP	GOTO +1
0561	REP	7	LAST 1096	6664	3 0165 0	SWBRANCH	CA BANKSET
0562	REP	19	LAST 1099	6665	54 004 1	TS	FBANK
0563	REP	25	LAST 1099	6666	50 164 1	INDEX	LOC
0564				6667	3 0001 0	CA	1
0565	REP	15	LAST 1099	6670	54 117 1	TS	POLISH
0566	REP	4	LAST 1099	6671	1 6616 1	TCP	GOTO +1

USER'S PAGE NO. 23 E3 93

WORK AREA.

USE THE GIVEN ADDRESS AS THE ADDRESS OF THE BRANCH ADDRESS.

ALLOWS ARBITRARY INDIRECTNESS LEVELS.

USE THE GIVEN ADDRESS AS THE ADDRESS OF THE BRANCH ADDRESS.

COMPUTED GO TO. PICK UP ADDRESS OF CADR LIST. ADD MODIFIER.

SELECT GOTO ADDRESS.

WITH ADDRESS IN A.

SWITCH INSTRUCTIONS WHICH ELECT TO BRANCH COME HERE TO DO SO.



L INTERPRETER

USER=5 PAGE NO. 24 E3 S3

P0567 TRIPLE PRECISION BRANCHING ROUTINE. IF CALLING TC IS AT L, RETURN IS AS FOLLOWS'

R0569 L+1 IF MPAC IS GREATER THAN ZERO.

R0570 L+2 IF MPAC IS EQUAL TO +0 OR -0.

R0571 L+3 IF MPAC IS LESS THAN ZERO.

0572	REF 311	LAST 1098	6672 10 154 0	BRANCH	CCS	MPAC
0573	REF 232	LAST 1092	6673 0 0002 0		TC	0
0574			6674 1 6676 1		TCP	+2
0575	REF 1		6675 1 6710 0		TCP	NEG

ON ZERO.

0576	REF 312	LAST 1100	6676 10 155 1		CCS	MPAC +1
0577	REF 233	LAST 1100	6677 0 0002 0		TC	0
0578			6700 1 6702 0		TCP	+2
0579	REF 2	LAST 1100	6701 1 6710 0		TCP	NEG

0580	REF 313	LAST 1100	6702 10 158 1		CCS	MPAC +2
0581	REF 234	LAST 1100	6703 0 0002 0		TC	0
0582			6704 1 6706 1		TCP	+2
0583	REF 3	LAST 1100	6705 1 6710 0		TCP	NEG

0584	REF 235	LAST 1100	6706 50 002 0	Q+1	INDEX	0
0585			6707 0 0001 0		TC	1

0586	REF 236	LAST 1100	6710 50 002 0	NEG	INDEX	0
0587			6711 0 0002 0		TC	2
0588	REF 4	LAST 1100	6710	Q+2	=	NEG

IF FIRST NON-ZERO REGISTER WAS NEGATIVE.

R0589 ITRACE (3) REFERS TO AEXITA.

0590	REF 8	LAST 1099	6712 3 0185 0	EXIT	CA	BANKSET
0591	REF 19	LAST 1098	6713 54 008 0		TS	BRANK
0592	REF 26	LAST 1099	6714 50 184 1		INDEX	LOC
0593			6715 0 0001 0		TC	1

RESTORE USER=5 BANK SETTING, AND LEAVE INTERPRETIVE MODE.



L INTERPRETER

USER'S PAGE NO. 25 E3 83

P0594 SECTION 3 - ADD/SUBTRACT PACKAGE.

P0595 THE FOLLOWING OPERATIONS ARE PROVIDED FOR ADDING TO AND SUBTRACTING FROM THE MULTI-PURPOSE ACCUMULATOR
P0597 MPAC'

P0598	1. DAD	DOUBLE PRECISION ADD.
P0599	2. DSU	DOUBLE PRECISION SUBTRACT.
P0600	3. BDSU	DOUBLE PRECISION SUBTRACT FROM.
P0601	4. TAD	TRIPLE PRECISION ADD.
P0602	5. VAD	VECTOR ADD.
P0603	6. VSU	VECTOR SUBTRACT.
P0604	7. BVSU	VECTOR SUBTRACT FROM.

P0605 THE INTERPRETIVE OVERFLOW INDICATOR OVIND IS SET NON-ZERO IF OVERFLOW OCCURS IN ANY OF THE ABOVE.

0607	REP 44 LAST 1077	6716 3 4674 0 VSU	CAP BIT15	CHANGES 0 TO DCS.
0608		6717 1 6721 1	TCF +2	
0609	REP 12 LAST 953	6720 3 4371 0 VAD	CAP PRIO30	CHANGES 0 TO DCA.
0610	REP 36 LAST 1099	6721 25 116 0	ADS ADDRWD	
0611		6722 0 0008 1	EXTEND	
0612	REP 39 LAST 1101	6723 5 0116 1	INDEX ADDRWD	
0613	REP 2 LAST 424	6724 00 003 1	READ HISCALAR	DCA 2 OR DCS 2
0614	REP 314 LAST 1100	6725 20 160 1	DAS MPAC +3	
0615		6726 0 0006 1	EXTEND	CHECK OVERFLOW.
0616		6727 1 6731 0	BZF +2	
0617	REP 1	6730 0 6763 0	TC OVERFLWY	
0618		6731 0 0006 1	EXTEND	
0619	REP 40 LAST 1101	6732 5 0116 1	INDEX ADDRWD	
0620	REP 8 LAST 1033	6733 00 005 1	READ CHANS	DCA 4 OR DCS 4
0621	REP 315 LAST 1101	6734 20 162 0	DAS MPAC +5	
0622		6735 0 0006 1	EXTEND	
0623		6736 1 6740 0	BZF +2	
0624	REP 1	6737 0 6760 0	TC OVERFLWZ	
0625		6740 0 0006 1	EXTEND	
0626	REP 41 LAST 1101	6741 5 0116 1	INDEX ADDRWD	
0627	REP 15 LAST 1049	6742 00 001 0	READ LCHAN	DCA 0 OR DCS 0
0628	REP 1	6743 1 6747 1	TCF ENDVXV	
0629		6744 0 0006 1 DAD	EXTEND	
0630	REP 42 LAST 1101	6745 5 0116 1	INDEX ADDRWD	
0631		6746 3 0001 0	DCA 0	
0632	REP 316 LAST 1101	6747 20 155 1	DAS MPAC	VXV FINISHES HERE.
0633		6750 0 0006 1	EXTEND	
0634	REP 17 LAST 1097	6751 1 6030 0	BZF DANZIG	



004 ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1102

L INTERPRETER

USER-S PAGE NO. 26 E3 53

0635	REP	1	6752	0	6766	0	SETOVF	TC	OVERFLOW
0636	REP	18	6753	1	6030	0		TCP	DANZIG



L INTERPRETER

USER-S PAGE NO. 27 E3 S1

0637			6754	0 0006 1	DSU	EXTEND	
0638	REF 43	LAST 1101	6755	5 0116 1		INDEX	ADDRWD
0639			6756	4 0001 1		DCS	0
0640	REF 2	LAST 1101	6757	1 6747 1		TCP	ENDVXV
0641	REF 168	LAST 1075	6760	54 001 1	OVERFLWZ	TS	L
0642	REF 26	LAST 1039	6761	3 4715 0		CAP	FIVE
0643			6762	1 6765 1		TCP	+3
0644	REF 169	LAST 1103	6763	54 001 1	OVERFLWZ	TS	L
0645	REF 40	LAST 1060	6764	3 6214 0		CAP	THREE
0646	REF 170	LAST 1103	6765	56 001 0		XCH	L
0647	REF 293	LAST 1099	6766	50 000 1	OVERFLOW	INDEX	A
0648	REF 5	LAST 1036	6767	4 4673 0		CS	LIMITS
0649	REF 44	LAST 389	6770	54 130 1		TS	BUP
0650			6771	0 0006 1		EXTEND	
0651	REF 294	LAST 1103	6772	24 000 1		AUG	A
0652	REF 171	LAST 1103	6773	50 001 0		INDEX	L
0653	REF 317	LAST 1101	6774	26 155 1		ADS	MPAC +1
0654			6775	54 007 1		TS	7
0655	REF 210	LAST 1077	6776	3 4714 1		CAP	ZERO
0656	REF 45	LAST 1103	6777	6 0130 0		AD	BUP
0657	REF 172	LAST 1103	7000	50 001 0		INDEX	L
0658	REF 318	LAST 1103	7001	26 154 0		ADS	MPAC
0659			7002	54 007 1		TS	7
0660	REF 237	LAST 1100	7003	0 0002 0		TC	0
0661	REF 1		7004	1 7121 0		TCP	SETOWP2
0662			7005	0 0006 1	BVSU	EXTEND	
0663	REF 44	LAST 1103	7006	5 0116 1		INDEX	ADDRWD
0664			7007	3 0003 1		DCA	2
0665	REF 319	LAST 1103	7010	52 160 1		DXCH	MPAC +3
0666			7011	0 0006 1		EXTEND	
0667			7012	4 0001 1		DCOM	
0668	REF 320	LAST 1103	7013	20 160 1		DAS	MPAC +3
0669			7014	0 0006 1		EXTEND	
0670			7015	1 7017 1		BZF	+2
0671	REF 2	LAST 1101	7016	0 6763 0		TC	OVERFLWZ
0672			7017	0 0006 1		EXTEND	
0673	REF 45	LAST 1103	7020	5 0116 1		INDEX	ADDRWD
0674			7021	3 0005 1		DCA	4
0675	REF 321	LAST 1103	7022	52 162 0		DXCH	MPAC +5
0676			7023	0 0006 1		EXTEND	
0677			7024	4 0001 1		DCOM	
0678	REF 322	LAST 1103	7025	20 162 0		DAS	MPAC +5
0679			7026	0 0006 1		EXTEND	
0680			7027	1 7031 0		BZF	+2
0681	REF 2	LAST 1101	7030	0 6760 0		TC	OVERFLWZ

ENTRY FOR THIRD COMPONENT.

ENTRY FOR SECOND COMPONENT.

ENTRY FOR 1ST COMP OR DP (L=0).
PICK UP POSMAX OR NEGMAX.

FORCE OVERFLOW.

NO OVERFLOW EXIT.
SET OVFLND AND EXIT.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1104

L INTERPRETER

USER'S PAGE NO. 28 E3 S3

0662			7031	0 0006 1	BDSU	EXTEND
0663	REP 46	LAST 1103	7032	5 0116 1		INDEX ADDRWD
0664			7033	3 0001 0		DCA 0
0665	REP 323	LAST 1103	7034	52 155 1		DXCH MPAC
0666			7035	0 0006 1		EXTEND
0667			7036	4 0001 1		DCOM
0668	REP 3	LAST 1103	7037	1 6747 1		TCP ENOVXV



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28,1968 SATRAP .007 PAGE 1105

L INTERPRETER

USER=3 PAGE NO. 29 E3 S3

P0689 TRIPLE PRECISION ADD ROUTINE.

0690			7040	0 0006 1	TAD	EXTEND	
0691	REF	47	LAST	1104	7041	5 0116 1	INDEX ADDRMD
0692					7042	3 0002 0	DCA 1
0693	REF	324	LAST	1104	7043	20 156 1	DAS MPAC +1
0694	REF	46	LAST	1105	7044	50 116 1	INDEX ADDRMD
0695					7045	6 0000 1	AD 0
0696	REF	325	LAST	1105	7046	6 0154 1	AD MPAC
0697	REF	326	LAST	1105	7047	54 154 0	TS MPAC
0698	REF	19	LAST	1102	7050	1 6030 0	TCP DANZIG
0699	REF	1			7051	1 6752 0	TCP SETOVF

ADD MINOR PARTS FIRST.

SET OVPIND IF SUCH OCCURS.



L INTERPRETER

USER=5 PAGE NO. 30 E3 S3

P0700 ARITHMETIC SUBROUTINES REQUIRED IN FIXED-FIXED.

R0701	1. DMPSUB	DOUBLE PRECISION MULTIPLY. MULTIPLY THE CONTENTS OF MPAC, +1 BY THE DP WORD WHOSE ADDRESS IS IN ADDRWD AND LEAVE A TRIPLE PRECISION RESULT IN MPAC.
R0703	2. ROUNDSUB	ROUND THE TRIPLE PRECISION CONTENTS OF MPAC TO DOUBLE PRECISION.
R0705	3. DOTSUB	TAKE THE DOT PRODUCT OF THE VECTOR IN MPAC AND THE VECTOR WHOSE ADDRESS IS IN ADDRWD AND LEAVE THE TRIPLE PRECISION RESULT IN MPAC.
R0707		
R0709	4. POLY	USING THE CONTENTS OF MPAC AS A DP ARGUMENT, EVALUATE THE POLYNOMIAL WHOSE DEGREE AND COEFFICIENTS IMMEDIATELY FOLLOW THE TC POLY INSTRUCTION (SEE ROUTINE FOR DETAILS.)
R0710		
R0712		
0714	REF 236 LAST 1103	7052 50 002 0 DMP INDEX 0 BASIC SUBROUTINE FOR USE BY PINBALL, ETC
0715		7053 3 0000 1 CAP 0 ADRES OF ARGUMENT FOLLOWS TC DMP
0716	REF 239 LAST 1108	7054 24 002 0 INCR 0
0717	REF 49 LAST 1105	7055 54 116 0 -1 TS ADDRWD (PROLOGUE FOR SETTING ADDRWD.)
0718	REF 50 LAST 1106	7056 50 116 1 DMPSUB INDEX ADDRWD GET MINOR PART OF OPERAND AT C(ADDRWD).
0719		7057 3 0001 0 CA 1
0720	REF 327 LAST 1105	7060 54 156 1 TS MPAC +2 THIS WORKS FOR SQUARING MPAC AS WELL.
0721	REF 211 LAST 1103	7061 3 4714 1 CAP ZERO SET MPAC +1 TO ZERO SO WE CAN ACCUMULATE
0722	REF 326 LAST 1106	7062 56 155 0 XCH MPAC +1 THE PARTIAL PRODUCTS WITH DAS
0723	REF 6 LAST 1074	7063 54 135 1 TS MPTMP INSTRUCTIONS.
0724		7064 0 0006 1 EXTEND
0725	REF 329 LAST 1106	7065 7 0156 1 MP MPAC +2 MINOR OF MPAC X MINOR OF C(ADDRWD).
0726	REF 330 LAST 1106	7066 56 156 0 XCH MPAC +2 DISCARD MINOR PART OF ABOVE RESULT AND
0727		7067 0 0006 1 EXTEND FORM MAJOR OF MPAC X MINOR OF C(ADDRWD).
0728	REF 331 LAST 1106	7070 7 0154 0 MP MPAC
0729	REF 332 LAST 1106	7071 20 156 1 DAS MPAC +1 GUARANTEED NO OVERFLOW.
0730	REF 51 LAST 1106	7072 50 116 1 INDEX ADDRWD GET MAJOR PART OF ARGUMENT AT C(ADDRWD).
0731		7073 3 0000 1 CA 0
0732	REF 9 LAST 1106	7074 56 135 0 XCH MPTMP SAVE AND BRING OUT MINOR OF MPAC.
0733		7075 0 0006 1 DMPSUB2 EXTEND
0734	REF 10 LAST 1106	7076 7 0135 1 MP MPTMP MAJOR OF C(ADDRWD) X MINOR OF MPAC.
0735	REF 333 LAST 1106	7077 20 156 1 DAS MPAC +1 ACCUMULATE, SETTING A TO NET OVERFLOW.
0736	REF 334 LAST 1106	7100 56 154 1 XCH MPAC SETTING MPAC TO 0 OR +-1.
0737		7101 0 0006 1 EXTEND
0738	REF 11 LAST 1106	7102 7 0135 1 MP MPTMP MAJOR OF MPAC X MAJOR OF C(ADDRWD).
0739	REF 335 LAST 1106	7103 20 155 1 DAS MPAC GUARANTEED NO OVERFLOW.
0740	REF 240 LAST 1106	7104 0 0002 0 TC 0 49 MCT = .573 MS. INCLUDING RETURN.



L INTERPRETER

USER'S PAGE NO. 31 E3 S3

P0741 ROUND MPAC TO DOUBLE PRECISION, SETTING OVPIND ON THE RARE EVENT OF OVERFLOW.

0743	REF 212	LAST 1106	7105	3 4714 1	ROUND SUB CAP	ZERO	SET MPAC +2 = 0 FOR SCALARS AND CHANGE
0744	REF 15	LAST 1098	7106	54 163 1	+1 TS	MODE	MODE TO DP.
0745	REF 336	LAST 1106	7107	56 156 0	VRound	XCH MPAC +2	BUT WE NEEDNT TAKE THE TIME FOR VECTORS.
0746			7110	8 0000 1	DOUBLE		
0747	REF 173	LAST 1103	7111	54 001 1	TS	L	
0748	REF 241	LAST 1106	7112	0 0002 0	TC	0	
0749	REF 337	LAST 1107	7113	6 0155 0	AD	MPAC +1	ADD ROUNDING BIT IF MPAC +2 WAS GREATER
0750	REF 338	LAST 1107	7114	54 155 1	TS	MPAC +1	THAN .5 IN MAGNITUDE.
0751	REF 242	LAST 1107	7115	0 0002 0	TC	0	
0752	REF 339	LAST 1107	7116	6 0154 1	AD	MPAC	PROPAGATE INTERFLOW.
0753	REF 340	LAST 1107	7117	54 154 0	TS	MPAC	
0754	REF 243	LAST 1107	7120	0 0002 0	TC	0	
0755	REF 2	LAST 844	7121	54 121 1	SET OVP2	TS OVPIND	(RARE).
0756	REF 244	LAST 1107	7122	0 0002 0	TC	0	



L INTERPRETER

USER=5 PAGE NO. 32 E3 S3

THE DOT PRODUCT SUBROUTINE USUALLY FORMS THE DOT PRODUCT OF THE VECTOR IN MPAC WITH A STANDARD SIX REGISTER VECTOR WHOSE ADDRESS IS IN ADDRWD. IN THIS CASE C(DOTINC) ARE SET TO 2. VCM, HOWEVER, SETS C(DOTINC) TO 6 SO THAT DOTSUB DOTS MPAC WITH A COLUMN VECTOR OF THE MATRIX IN QUESTION IN THIS CASE.

0763 REF 52 LAST 1071 7123 3 4711 1 PREDOT CAP TWO
0764 REF 4 LAST 66 7124 54 136 1 TS DOTINC PROLOGUE TO SET DOTINC TO 2.

0765 7125 0 0008 1 DOTSUB EXTEND
0768 REF 5 LAST 66 7126 22 137 1 QXCH DOTRET
0767 REF 1 7127 0 7058 0 TC DMPSUB
0768 REF 341 LAST 1107 7130 52 160 1 DXCH MPAC +3
0769 REF 342 LAST 1108 7131 52 155 1 DXCH MPAC
0770 REF 46 LAST 1103 7132 52 131 0 DXCH BUF
0771 REF 343 LAST 1108 7133 3 0156 0 CA MPAC +2
0772 REF 47 LAST 1108 7134 54 132 0 TS BUF +2

0773 REF 5 LAST 1108 7135 3 0138 0 CA DOTINC
0774 REF 52 LAST 1108 7136 26 118 0 ADS ADDRWD
0775 REF 2 LAST 1108 7137 0 7058 0 TC DMPSUB
0776 REF 344 LAST 1108 7140 52 156 1 DXCH MPAC +1
0777 REF 48 LAST 1108 7141 20 132 0 DAS BUF +1
0778 REF 345 LAST 1108 7142 6 0154 1 AD MPAC
0779 REF 49 LAST 1108 7143 8 0130 0 AD BUF
0780 REF 50 LAST 1108 7144 54 130 1 TS BUF
0781 7145 1 7147 0 TCP +2
0782 REF 3 LAST 1107 7146 54 121 1 TS OVPIND

0783 REF 346 LAST 1108 7147 52 162 0 DXCH MPAC +5
0784 REF 347 LAST 1108 7150 52 155 1 DXCH MPAC
0785 REF 6 LAST 1108 7151 3 0136 0 CA DOTINC
0786 REF 53 LAST 1108 7152 26 118 0 ADS ADDRWD
0787 REF 3 LAST 1108 7153 0 7058 0 TC DMPSUB
0788 REF 51 LAST 1108 7154 52 132 0 ENDDOT DXCH BUF +1
0789 REF 348 LAST 1108 7155 20 156 1 DAS MPAC +1
0790 REF 349 LAST 1108 7156 6 0154 1 AD MPAC
0791 REF 52 LAST 1108 7157 6 0130 0 AD BUF
0792 REF 350 LAST 1108 7160 54 154 0 TS MPAC
0793 REF 6 LAST 1108 7161 0 0137 1 TC DOTRET

0794 REF 2 LAST 1102 7162 0 6768 0 TC OVERFLOW
0795 REF 7 LAST 1108 7163 0 0137 1 TC DOTRET

SAVE RETURN.
DOT X COMPONENTS.
POSITION Y COMPONENT OF MPAC FOR
MULTIPLICATION WHILE SAVING RESULT IN
THREE WORD BUFFER, BUF.

ADVANCE ADDRWD TO Y COMPONENT OF
OTHER ARGUMENT.

ACCUMULATE PARTIAL PRODUCTS.

IF OVERFLOW OCCURS.

MULTIPLY Z COMPONENTS.

LEAVE FINAL ACCUMULATION IN MPAC.

ON OVERFLOW HERE.

L INTERPRETER

USER=8 PAGE NO. 33 E3 S3

P0796 DOUBLE PRECISION POLYNOMIAL EVALUATOR

THIS ROUTINE EVALUATES $A X^N + A X^{N-1} + \dots + A X + A$ LEAVING THE DP RESULT IN MPAC ON EXIT.

R0801 THE ROUTINE HAS TWO ENTRIES

1. ENTRY THRU POWRSERS. THE COEFFICIENTS MAY BE EITHER IN FIXED OR ERASABLE, THE CALL IS BY TC POWRSERS, AND THE RETURN IS TO LOC(TC POWRSERS)+1. THE ENTERING DATA MUST BE AS FOLLOWS

A0806	A	SP	LOC-3	ADDRESS FOR REFERENCING COEP TABLE
A0807	L	SP	N-1	N IS THE DEGREE OF THE POWER SERIES
A0808	MPAC	DP	X	ARGUMENT

A0809	LOC-2N	DP	A(0)
A0810	...		
A0811	LOC	DP	A(N)

2. ENTRY THRU POLY. THE CALL TO POLY AND THE ENTERING DATA MUST BE AS FOLLOWS

A0814	MPAC	DP	X	ARGUMENT
A0815	LOC	TC	POLY	
A0816	LOC+1	SP	N-1	
A0817	LOC+2	DP	A(0)	
A0818	...			
A0819	LOC+2N+2	DP	A(N)	RETURN IS TO LOC+2N+4

0820			7164 0 0006 1	POWRSERS	EXTEND	
0821	REF	1	7165 22 141 0		QXCH	POLYRET
0822	REF	16	7166 54 117 1		TS	POLISH
0823	REF	1	7167 22 140 1		LXCH	POLYCNT
0824	REF	1	7170 1 7201 1		TCF	POLYCOM
						SKIP SET UP BY POLY
0825	REF	245	7171 50 002 0	POLY	INDEX	0
0826			7172 3 0000 1		CAP	0
0827	REF	2	7173 54 140 0		TS	POLYCNT
0828			7174 6 0000 1		DOUBLE	
0829	REF	246	7175 6 0002 0		AD	0
0830	REF	17	7176 54 117 1		TS	POLISH
0831	REF	27	7177 6 4715 0		AD	FIVE
0832	REF	2	7200 54 141 1		TS	POLYRET
						STORE RETURN ADDRESS
0833	REF	1	7201 3 6242 0	POLYCOM	CAP	LVBUP
0834	REF	54	7202 54 116 0		TS	ADDRWD
						INCOMING X WILL BE MOVED TO VRUP, SO
						SET ADDRWD SO DMPSUB WILL MPY BY VRUP.
0835			7203 0 0006 1	EXTEND		
0836	REF	18	7204 5 0117 0		INDEX	POLISH
0837			7205 3 0004 0		DCA	3



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28,1968 SATRAP .007 PAGE 1110

L INTERPRETER

0838	REF	351	LAST 1108	7206	52 155 1			
0839	REF	23	LAST 1085	7207	52 123 0	DXCH	MPAC	
0840	REF	1		7210	1 7214 0	DXCH	VBUP	
						TOP	POLY2	
0841	REF	3	LAST 1109	7211	54 140 0	POLYLOOP	TS	POLYCNT
0842	REF	53	LAST 1108	7212	4 4711 0		CS	TWO
0843	REF	19	LAST 1109	7213	26 117 1		ADS	POLISH
0844	REF	4	LAST 1108	7214	0 7056 0	POLY2	TC	DMPSUB
0845				7215	0 0006 1		EXTEND	
0846	REF	20	LAST 1110	7216	5 0117 0		INDEX	POLISH
0847				7217	3 0002 0		DCA	1
0848	REF	352	LAST 1110	7220	20 155 1		DAS	MPAC
0849	REF	4	LAST 1110	7221	10 140 0	CCS	POLYCNT	
0850	REF	1		7222	1 7211 0	TOP	POLYLOOP	
0851	REF	3	LAST 1109	7223	0 0141 0	TC	POLYRET	

USERS PAGE NO. 34 E3 S3

LOAD A(N) INTO MPAC,
SAVING X IN VBUP

SAVE DECREMENTED LOOP COUNTER

REGRESS COEFFICIENT POINTER

MULTIPLY BY X

ADD IN NEXT COEFFICIENT
USERS RESPONSIBILITY TO ASSURE NO OVFLOW

RETURN CALLER



L INTERPRETER

USER'S PAGE NO. 35

E3 S3

P0852 MISCELLANEOUS MULTI-PRECISION ROUTINES REQUIRED IN FIXED-FIXED BUT NOT USED BY THE INTERPRETER.

085398	REF 213	LAST D107	7224	3 4714 1	DPAGREE	CAP	ZERO	DOUBLE PRECISION ENTRY -
085399	REF 353	LAST D110	7225	54 156 1		TS	MPAC +2	ZERO LOW-ORDER WORD
0854	REF 247	LAST D109	7228	22 002 0	TPAGREE	LXCH	0	FORCE SIGN AGREEMENT AMONG THE TRIPLE
0855	REF 1		7227	0 6872 1		TC	BRANCH	PRECISION CONTENTS OF MPAC. RETURNING
0856	REF 1		7230	1 7234 1		TCF	ARG+	WITH SIGNUM OF THE INPUT IN A.
0857	REF 1		7231	1 7254 1		TCF	ARGZERO	
0858	REF 28	LAST D1043	7232	4 4872 1		CS	POS MAX	IF NEGATIVE.
0859			7233	1 7235 0		TCF	+2	
0860	REF 29	LAST D111	7234	3 4872 0	ARG+	CAP	POS MAX	
0861	REF 248	LAST D111	7235	54 002 1		TS	0	
0862			7236	0 0008 1		EXTEND		
0863	REF 295	LAST D103	7237	24 000 1		ALG	A	FORMS +-1.0.
0864	REF 354	LAST D111	7240	6 0158 0		AD	MPAC +2	
0865	REF 355	LAST D111	7241	54 156 1		TS	MPAC +2	
0866	REF 214	LAST D111	7242	3 4714 1		CAP	ZERO	
0867	REF 249	LAST D111	7243	6 0002 0		AD	0	
0868	REF 356	LAST D111	7244	6 0155 0		AD	MPAC +1	
0869	REF 357	LAST D111	7245	54 155 1		TS	MPAC +1	
0870	REF 215	LAST D111	7248	3 4714 1		CAP	ZERO	
0871	REF 250	LAST D111	7247	6 0002 0		AD	0	0 STILL HAS POS MAX OR NEG MAX IN IT.
0872	REF 358	LAST D111	7250	6 0154 1		AD	MPAC	
0873	REF 359	LAST D111	7251	54 154 0	ARGZERO2	TS	MPAC	ALWAYS SKIPPING UNLESS ARGZERO.
0874	REF 360	LAST D111	7252	54 155 1		TS	MPAC +1	
0875	REF 174	LAST D107	7253	0 0001 0		TC	L	RETURN VIA L.
0876	REF 361	LAST D111	7254	54 158 1	ARGZERO	TS	MPAC +2	SET ALL THREE MPAC REGISTERS TO ZERO.
0877	REF 1		7255	1 7251 1		TCF	ARGZERO2	
R0878								
0880	REF 12	LAST D108	7258	54 135 1	SHORTMP	TS	MPTMP	
0881			7257	0 0008 1		EXTEND		
0882	REF 362	LAST D111	7260	7 0158 1		MP	MPAC +2	
0883	REF 363	LAST D111	7261	54 158 1		TS	MPAC +2	
0884	REF 218	LAST D111	7282	3 4714 1	SHORTMP2	CAP	ZERO	SO SUBSEQUENT DAS WILL WORK.
0885	REF 364	LAST D111	7283	56 155 0		LXCH	MPAC +1	
0886	REF 1		7264	1 7075 0		TCF	DMP SUB2	

L INTERPRETER

USER'S PAGE NO. 38 E3 S3

P0887 DMPNSUB MULTIPLIES THE DP FRACTION ARRIVING IN MPAC BY THE SP
 P0888 INTEGER ARRIVING IN A. THE DP PRODUCT DEPARTS BOTH IN MPAC AND IN
 P0889 A AND L. NOTE THAT DMPNSUB NORMALLY INCREASES THE MAGNITUDE OF THE
 P0890 CONTENTS OF MPAC. THE CUSTOMER MUST INSURE THAT B(A) X B(MPAC,MPAC+1)
 P0891 AND B(A) X B(MPAC) ARE LESS THAN 1 IN MAGNITUDE, WHERE B, AS IS OBVIOUS,
 P0892 INDICATES THE ARRIVING CONTENTS.

0893	REP	1		7265	54 135 1	DMPNSUB	TS	DMPNTEMP
0894				7266	0 0006 1		EXTEND	
0895	REP	365	LAST 1111	7267	7 0155 1		MP	MPAC +1
0896	REP	366	LAST 1112	7270	52 155 1		DACH	MPAC
0897				7271	0 0006 1		EXTEND	
0898	REP	2	LAST 1112	7272	7 0135 1		MP	DMPNTEMP
0899	REP	175	LAST 1111	7273	3 0001 0		CA	L
0900	REP	367	LAST 1112	7274	26 154 0		ADS	MPAC
0901				7275	0 0006 1		EXTEND	
0902	REP	368	LAST 1112	7276	3 0155 0		DCA	MPAC
0903	REP	251	LAST 1111	7277	0 0002 0		TC	Q

LOW PRODUCT TO MPAC, HIGH FACTOR TO A

COMPLETING THE PRODUCT IN MPAC

BRINGING THE PRODUCT INTO A AND L



L INTERPRETER

USER=8 PAGE NO. 37 E3 S3

P0904 MISCELLANEOUS VECTOR OPERATIONS. INCLUDED HERE ARE THE FOLLOWING:

R0905		1. DOT				DP VECTOR DOT PRODUCT.			
R0906		2. VXV				DP VECTOR CROSS PRODUCT.			
R0907		3. VXSC				DP VECTOR TIMES SCALAR.			
R0908		4. V/SC				DP VECTOR DIVIDED BY SCALAR.			
R0909		5. VPROJ				DP VECTOR PROJECTION. ((MPAC.X)MPAC).			
R0910		6. VXM				DP VECTOR POST-MULTIPLIED BY MATRIX.			
R0911		7. MXV				DP VECTOR PRE-MULTIPLIED BY MATRIX.			
0912	RESP	1		7300	0 7123 0	DOT	TC	PREDOT	DO THE DOT PRODUCT AND EXIT, CHANGING
0913	RESP	217	LAST 1111	7301	3 4714 1	DMODE	CAP	ZERO	THE MODE TO DP SCALAR.
0914	RESP	3	LAST 1094	7302	1 8027 0		TCF	NEWMODE	
0915	RESP	54	LAST 1110	7303	3 4711 1	MXV	CAP	TWO	SET UP MATINC AND DOTINC FOR ROW
0916	RESP	5	LAST 68	7304	54 140 0		TS	MATINC	VECTORS.
0917	RESP	1		7305	1 7311 1		TCF	VXM/MXV	GO TO COMMON PORTION.
0918	RESP	9	LAST 1040	7306	4 4377 1	VXM	CS	TEN	SET MATINC AND DOTINC TO REFER TO MATRIX
0919	RESP	8	LAST 1113	7307	54 140 0		TS	MATINC	AS THREE COLUMN VECTORS.
0920	RESP	35	LAST 1028	7310	3 6211 0		CAP	SIX	



L INTERPRETER

USER=8 PAGE NO. 38 E3 83

P0921 COMMON PORTION OF MOV AND VOM.

0922	REF	7	LAST 1108	7311	54 138 1	VOM/MOV	TS	DOTINC
R0923			ITRACE (2) REFERS TO MOV/MOVA.					
0924	REF	1		7312	0 7501 1		TC	MPAC/BUF
0925	REF	1		7313	0 7125 0		TC	DOTSUB
0926				7314	0 0006 1		EXTEND	
0927	REF	24	LAST 1110	7315	3 0123 1		DCA	VBUP
0928	REF	369	LAST 1112	7316	52 155 1		DXCH	MPAC
0929	REF	11	LAST 1074	7317	52 134 0		DXCH	BUF2
0930				7320	0 0006 1		EXTEND	
0931	REF	25	LAST 1114	7321	3 0125 1		DCA	VBUP +2
0932	REF	370	LAST 1114	7322	52 160 1		DXCH	MPAC +3
0933				7323	0 0006 1		EXTEND	
0934	REF	26	LAST 1114	7324	3 0127 0		DCA	VBUP +4
0935	REF	371	LAST 1114	7325	52 162 0		DXCH	MPAC +5
0936	REF	7	LAST 1113	7326	3 0140 1		CA	MATINC
0937	REF	55	LAST 1109	7327	26 116 0		ADS	ADDRWD
0938	REF	2	LAST 1114	7330	0 7125 0		TC	DOTSUB
0939	REF	27	LAST 1114	7331	52 123 0		DXCH	VBUP
0940	REF	372	LAST 1114	7332	52 155 1		DXCH	MPAC
0941	REF	26	LAST 1114	7333	52 125 0		DXCH	VBUP +2
0942	REF	373	LAST 1114	7334	52 160 1		DXCH	MPAC +3
0943	REF	29	LAST 1114	7335	52 127 1		DXCH	VBUP +4
0944	REF	374	LAST 1114	7336	52 162 0		DXCH	MPAC +5
0945	REF	6	LAST 1114	7337	3 0140 1		CA	MATINC
0946	REF	56	LAST 1114	7340	26 116 0		ADS	ADDRWD
0947	REF	3	LAST 1114	7341	0 7125 0		TC	DOTSUB
0948	REF	12	LAST 1114	7342	52 134 0		DXCH	BUF2
0949	REF	375	LAST 1114	7343	52 155 1		DXCH	MPAC
0950	REF	376	LAST 1114	7344	52 162 0		DXCH	MPAC +5
0951	REF	30	LAST 1114	7345	52 125 0		DXCH	VBUP +2
0952	REF	377	LAST 1114	7346	52 160 1		DXCH	MPAC +3
0953	REF	20	LAST 1105	7347	1 6030 0		TCP	DANZIG

SAVE VECTOR IN MPAC FOR FURTHER USE.

GO DOT TO GET X COMPONENT OF ANSWER.

MOVE MPAC VECTOR BACK INTO MPAC, SAVING
NEW X COMPONENT IN BUF2.INITIALIZE ADDRWD FOR NEXT DOT PRODUCT.
FORMS BASE ADDRESS OF NEXT COLUMN(ROW).MOVE GIVEN VECTOR BACK TO MPAC, SAVING Y
COMPONENT OF ANSWER IN VBUP +2.

FORM ADDRESS OF LAST COLUMN OR ROW.

ANSWER NOW COMPLETE. PUT COMPONENTS INTO
PROPER MPAC REGISTERS.

EXIT.



L INTERPRETER

USER=5 PAGE NO. 39 E3 S3

P0954 VXSC - VECTOR TIMES SCALAR.

0955	REP	16	LAST 1107	7350	10 183 1	VXSC	CCS	MODE
0956	REP	1		7351	1 7377 1		TCP	DXVSC
0957	REP	2	LAST 1115	7352	1 7377 1		TCP	DXVSC
0958	REP	5	LAST 1110	7353	0 7056 0	VXSC	TC	DMP SUB
0959	REP	1		7354	0 7107 0		TC	VRQND
0960	REP	376	LAST 1114	7355	52 180 1		DXCH	MPAC +3
0961	REP	379	LAST 1115	7356	52 155 1		DXCH	MPAC
0962	REP	380	LAST 1115	7357	52 180 1		DXCH	MPAC +3
0963	REP	6	LAST 1115	7360	0 7056 0		TC	DMP SUB
0964	REP	2	LAST 1115	7361	0 7107 0		TC	VRQND
0965	REP	381	LAST 1115	7362	52 182 0		DXCH	MPAC +5
0966	REP	382	LAST 1115	7363	52 155 1		DXCH	MPAC
0967	REP	383	LAST 1115	7364	52 182 0		DXCH	MPAC +5
0968	REP	7	LAST 1115	7365	0 7056 0		TC	DMP SUB
0969	REP	3	LAST 1115	7366	0 7107 0		TC	VRQND
0970	REP	384	LAST 1115	7367	52 155 1	VROTATEX	DXCH	MPAC
0971	REP	385	LAST 1115	7370	52 182 0		DXCH	MPAC +5
0972	REP	386	LAST 1115	7371	52 180 1		DXCH	MPAC +3
0973	REP	387	LAST 1115	7372	52 155 1		DXCH	MPAC
0974	REP	21	LAST 1114	7373	1 6030 0		TCP	DANZIG

TEST PRESENT MODE.
SEPARATE ROUTINE WHEN SCALAR IS IN MPAC.COMPUTE X COMPONENT
AND ROUND IT.
PUT Y COMPONENT INTO MPAC SAVING MPAC IN
MPAC +3.

DO SAME FOR Y AND Z COMPONENTS.

EXIT USED TO RESTORE MPAC AFTER THIS
TYPE OF ROTATION. CALLED BY VECTOR SHIFT
RIGHT, V/SC, ETC.



L INTERPRETER

USER=3 PAGE NO. 40 E3 S3

P0975 DP VECTOR PROJECTION ROUTINE.

0976	REF	2	LAST 1113	7374	0	7123	0	VPROJ	TC	PREDOT
0977	REF	15	LAST 1030	7375	4	4710	1		CS	PCUR
0978	REF	57	LAST 1114	7378	26	118	0		ADS	ADDRWD

(MPAC,X)MPAC IS COMPUTED AND LEFT IN
MPAC. DO DOT AND FALL INTO DVXSC.

R0979 VXSC WHEN SCALAR ARRIVES IN MPAC AND VECTOR IS AT X.

0980				7377	0	0006	1	DVXSC	EXTEND	
0981	REF	386	LAST 1115	7400	3	0155	0		DCA	MPAC
0982	REF	389	LAST 1116	7401	52	180	1		DXCH	MPAC +3
0983	REF	8	LAST 1115	7402	0	7058	0		TC	DMPSUB
0984	REF	4	LAST 1115	7403	0	7107	0		TC	VRQND
0985	REF	55	LAST 1113	7404	3	4711	1		CAP	TWO
0986	REF	58	LAST 1118	7405	26	118	0		ADS	ADDRWD
0987				7406	0	0006	1		EXTEND	
0988	REF	390	LAST 1116	7407	3	0180	0		DCA	MPAC +3
0989	REF	391	LAST 1116	7410	52	155	1		DXCH	MPAC
0990	REF	392	LAST 1118	7411	52	182	0		DXCH	MPAC +5
0991	REF	9	LAST 1116	7412	0	7058	0		TC	DMPSUB
0992	REF	5	LAST 1116	7413	0	7107	0		TC	VRQND
0993	REF	56	LAST 1116	7414	3	4711	1		CAP	TWO
0994	REF	59	LAST 1116	7415	26	118	0		ADS	ADDRWD
0995	REF	393	LAST 1116	7418	52	180	1		DXCH	MPAC +3
0996	REF	394	LAST 1116	7417	52	155	1		DXCH	MPAC
0997	REF	395	LAST 1116	7420	52	180	1		DXCH	MPAC +3
0998	REF	10	LAST 1116	7421	0	7058	0		TC	DMPSUB
0999	REF	6	LAST 1116	7422	0	7107	0		TC	VRQND
1000	REF	396	LAST 1116	7423	52	155	1		DXCH	MPAC
1001	REF	397	LAST 1116	7424	52	182	0		DXCH	MPAC +5
1002	REF	398	LAST 1116	7425	52	155	1		DXCH	MPAC
1003	REF	1		7426	1	6470	0		TCF	VMODE

SAVE SCALAR IN MPAC +3 AND GET X
COMPONENT OF ANSWER.

ADVANCE ADDRWD TO Y COMPONENT OF X.

PUT SCALAR BACK INTO MPAC AND SAVE
X RESULT IN MPAC +5.

TO Z COMPONENT.
BRING SCALAR BACK, PUTTING Y RESULT IN
THE PROPER PLACE.

PUT Z COMPONENT IN PROPER PLACE, ALSO
POSITIONING X.

MODE HAS CHANGED TO VECTOR.

L INTERPRETER

USER=3 PAGE NO. 41 E3 S3

P1004 THE VECTOR CROSS PRODUCT ROUTINE CALCULATES (X M -X M ,X M -X M ,X M -X M) WHERE M IS THE VECTOR IN
R1006 3 2 2 3 1 3 3 1 2 1 2

R1008 MPAC AND X THE VECTOR AT THE GIVEN ADDRESS.

1009 7427 0 0006 1 VXV
1010 REP 399 LAST 1116 7430 3 0162 1
1011 REP 400 LAST 1117 7431 52 155 1
1012 REP 31 LAST 1114 7432 52 123 0
1013 REP 11 LAST 1116 7433 0 7056 0

EXTEND

DCA MPAC +5
DXCH MPAC
DXCH VBUP
TC DMPSUB

FORM UP M3X1, LEAVING M1 IN VBUP.
BY X1.

1014 7434 0 0006 1
1015 REP 401 LAST 1117 7435 4 0160 1
1016 REP 402 LAST 1117 7436 52 155 1
1017 REP 32 LAST 1117 7437 52 125 0
1018 REP 12 LAST 1117 7440 0 7056 0

EXTEND

DCS MPAC +3
DXCH MPAC
DXCH VBUP +2
TC DMPSUB

CALCULATE -X1M2, SAVING X1M3 IN VBUP +2.

1019 REP 57 LAST 1116 7441 3 4711 1
1020 REP 60 LAST 1116 7442 28 116 0
1021 7443 0 0006 1
1022 REP 403 LAST 1117 7444 4 0162 0
1023 REP 404 LAST 1117 7445 52 155 1
1024 REP 405 LAST 1117 7446 52 162 0
1025 REP 13 LAST 1117 7447 0 7056 0

CAP TWO

ADS ADDRWD

EXTEND

DCS MPAC +5
DXCH MPAC
DXCH MPAC +5
TC DMPSUB

ADVANCE ADDRWD TO X2.

PREPARE TO GET -X2M3, SAVING -X1M2 IN MPAC +5.

1026 7450 0 0006 1
1027 REP 33 LAST 1117 7451 3 0123 1
1028 REP 406 LAST 1117 7452 52 155 1
1029 REP 34 LAST 1117 7453 52 127 1
1030 REP 14 LAST 1117 7454 0 7056 0

EXTEND

DCA VBUP
DXCH MPAC
DXCH VBUP +4
TC DMPSUB

GET X2M1, SAVING -X2M3 IN VBUP +4.

1031 REP 56 LAST 1117 7455 3 4711 1
1032 REP 61 LAST 1117 7456 28 116 0
1033 7457 0 0006 1
1034 REP 35 LAST 1117 7460 4 0123 0
1035 REP 407 LAST 1117 7461 52 155 1
1036 REP 408 LAST 1117 7462 20 162 0

CAP TWO

ADS ADDRWD

EXTEND

DCS VBUP
DXCH MPAC
DAS MPAC +5

ADVANCE ADDRWD TO X3.

GET -X3M1, ADDING X2M1 TO MPAC +5 TO COMPLETE THE Z COMPONENT OF THE ANSWER.

1037 7463 0 0006 1
1038 7464 1 7466 0
1039 REP 3 LAST 1103 7465 0 6760 0

EXTEND

BZF +2
TC OVERFLWZ

1040 REP 15 LAST 1117 7466 0 7056 0
1041 REP 36 LAST 1117 7467 52 125 0
1042 REP 409 LAST 1117 7470 52 160 1
1043 REP 410 LAST 1117 7471 52 155 1
1044 REP 411 LAST 1117 7472 20 160 1

TC DMPSUB

DXCH VBUP +2
DXCH MPAC +3
DXCH MPAC
DAS MPAC +3

MOVE X1M3 TO MPAC +3 SETTING UP FOR X3M2 AND ADD -X3M1 TO MPAC +3 TO COMPLETE THE Y COMPONENT OF THE RESULT.

1045 7473 0 0006 1
1046 7474 1 7476 1

EXTEND

BZF +2



L INTERPRETER

USER-S PAGE NO. 42 E3 S3

1047	REP	3	LAST 1103	7475	0 6763 0	TC	OVERFLW	
1048	REP	16	LAST 1117	7476	0 7056 0	TC	DMPSUB	
1049	REP	37	LAST 1117	7477	52 127 1	DXCH	VBUP +4	
1050	REP	4	LAST 1104	7500	1 6747 1	TOP	ENDVXV	GO ADD -X2M3 TO X3M2 TO COMPLETE THE X COMPONENT (TAIL END OF DAD).
R1051 THE MPACVBUP SUBROUTINE SAVES THE VECTOR IN MPAC IN VBUP WITHOUT CLOBBERING MPAC.								
1053				7501	0 0006 1	MPACVBUP	EXTEND	CALLED BY MXV, VXM, AND UNIT.
1054	REP	412	LAST 1117	7502	3 0155 0	DCA	MPAC	
1055	REP	38	LAST 1118	7503	52 123 0	DXCH	VBUP	
1056				7504	0 0006 1	EXTEND		
1057	REP	413	LAST 1118	7505	3 0160 0	DCA	MPAC +3	
1058	REP	39	LAST 1118	7506	52 125 0	DXCH	VBUP +2	
1059				7507	0 0006 1	EXTEND		
1060	REP	414	LAST 1118	7510	3 0162 1	DCA	MPAC +5	
1061	REP	40	LAST 1118	7511	52 127 1	DXCH	VBUP +4	
1062	REP	252	LAST 1112	7512	0 0002 0	TC	0	RETURN TO CALLER.
R1063 DOUBLE PRECISION SIGN AGREE ROUTINE. ARRIVE WITH INPUT IN A+L. OUTPUT IS IN A + L.								
1065	REP	296	LAST 1111	7513	10 000 0	ALSIGNAG	CCS	A
1066	REP	1		7514	1 7520 0	TOP	UPPOS	TEST UPPER PART.
1067	REP	253	LAST 1118	7515	0 0002 0	TC	0	IT IS POSITIVE
1068	REP	1		7516	1 7530 1	TOP	UPNEG	ZERO
1069	REP	254	LAST 1118	7517	0 0002 0	TC	0	NEGATIVE
								ZERO
1070	REP	176	LAST 1112	7520	56 001 0	UPPOS	XCH	L
1071	REP	9	LAST 1062	7521	6 4675 1	AD	HALP	SAVE DECREMENTED UPPER PART.
1072	REP	10	LAST 1118	7522	6 4675 1	AD	HALP	
1073	REP	297	LAST 1118	7523	54 000 0	TS	A	SKIPS ON OVERFLOW
1074				7524	1 7526 0	TOP	+2	
1075	REP	177	LAST 1118	7525	24 001 0	INCR	L	RESTORE UPPER TO ROIGINAL VALUE
1076	REP	178	LAST 1118	7526	56 001 0	XCH	L	SWAP A + L BACK.
1077	REP	255	LAST 1118	7527	0 0002 0	TC	0	
1078	REP	179	LAST 1118	7530	56 001 0	UPNEG	XCH	L
1079	REP	11	LAST 1033	7531	6 4674 0	AD	NEGMX	SAVE COMPLEMENTED + DECREMENTED UPPER PT
1080	REP	24	LAST 1089	7532	6 7716 0	AD	NEGCNE	
1081	REP	298	LAST 1118	7533	54 000 0	TS	A	
1082				7534	1 7536 1	TOP	+2	DONT INCREMENT IF NO OVERFLOW.
1083	REP	180	LAST 1118	7535	24 001 0	INCR	L	
1084	REP	181	LAST 1118	7536	56 001 0	XCH	L	
1085				7537	4 0000 0	COM		MAKE NEGATIVE AGAIN.
1086	REP	256	LAST 1118	7540	0 0002 0	TC	0	

L INTERPRETER

USER'S PAGE NO. 43 E3 S3

P1067 INTERPRETIVE INSTRUCTIONS WHOSE EXECUTION CONSISTS OF PRINCIPALLY CALLING SUBROUTINES.

1069	REF	17	LAST	1116	7541	0	7056	0	DMP1	TC	DMP SUB	DMP INSTRUCTION.
1090	REF	22	LAST	1115	7542	1	6030	0		TCF	DANZIG	
1091	REF	16	LAST	1119	7543	0	7056	0	DMPR	TC	DMP SUB	
1092	REF	1			7544	0	7108	1		TC	ROUND SUB +1	(C(A) = +0).
1093	REF	23	LAST	1119	7545	1	6030	0		TCF	DANZIG	
1094					7546	0	0008	1	DDV	EXTEND		
1095	REF	62	LAST	1117	7547	5	0118	1		INDEX	ADDRWD	MOVE DIVIDEND INTO BUF.
1096					7550	3	0001	0		DCA	0	
1097	REF	2	LAST	1086	7551	1	7556	1		TCF	DDV +4	
1098					7552	0	0008	1	DDV	EXTEND		
1099	REF	63	LAST	1119	7553	5	0118	1		INDEX	ADDRWD	MOVE DIVISOR INTO MPAC SAVING MPAC, THE
1100					7554	3	0001	0		DCA	0	DIVIDEND, IN BUF.
1101	REF	415	LAST	1118	7555	52	155	1		DXCH	MPAC	
1102	REF	53	LAST	1108	7556	52	131	0	+4	DXCH	BUF	
1103	REF	216	LAST	1113	7557	3	4714	1		CAP	ZERO	DIVIDE ROUTINES IN BANK 0.
1104	REF	20	LAST	1099	7560	54	004	1		TS	FBANK	
1105	REF	1			7561	1	2353	1		TCF	DDV/DDV	
1106	REF	64	LAST	1119	7562	3	0118	1	SETPD	CA	ADDRWD	MUST SET TO WORK AREA, OR FBANK TROUBLE.
1107	REF	12	LAST	1096	7563	54	166	1		TS	PUSHLOC	
1108	REF	1			7564	1	6032	1		TCF	NOIBKSW	NO FBANK SWITCH REQUIRED.
1109	REF	219	LAST	1119	7565	3	4714	1	TSLC	CAP	ZERO	SHIFTING ROUTINES LOCATED IN BANK 00.
1110	REF	21	LAST	1119	7566	54	004	1		TS	FBANK	
1111	REF	1			7567	1	2172	0		TCF	TSLC2	
1112	REF	7	LAST	1076	7570	3	6043	0	GSHIFT	CAP	LOW7	USED AS MASK AT GENSHIFT. THIS PROCESSES
1113	REF	22	LAST	1119	7571	54	004	1		TS	FBANK	ANY SHIFT INSTRUCTION (EXCEPT TSLC) WITH
1114	REF	1			7572	1	2214	0		TCF	GENSHIFT	AN ADDRESS (ROUTINES IN BANK 0).

L INTERPRETER

USER=5 PAGE NO. 44 E3 S3

THE FOLLOWING IS THE PROLOGUE TO V/SC. IF THE PRESENT MODE IS VECTOR, IT SAVES THE SCALAR AT X IN BUF
AND CALLS THE V/SC ROUTINE IN BANK 0. IF THE PRESENT MODE IS SCALAR, IT MOVES THE VECTOR AT X INTO MPAC, SAVING
THE SCALAR IN MPAC IN BUF BEFORE CALLING THE V/SC ROUTINE IN BANK 0.

1120	REF 17	LAST 1115	7573	10 183 1	V/SC	CCS	MODE	
1121	REF 1		7574	1 7605 1		TCP	DV/SC	MOVE VECTOR INTO MPAC.
1122	REF 2	LAST 1120	7575	1 7605 1		TCP	DV/SC	
1123			7576	0 0006 1	VV/SC	EXTEND		
1124	REF 65	LAST 1119	7577	5 0116 1		INDEX	ADDRWD	
1125			7600	3 0001 0		DCA	0	
1126	REF 54	LAST 1119	7601	52 131 0	V/SC1	DXCH	BUF	IN BOTH CASES, VECTOR IS NOW IN MPAC AND
1127	REF 220	LAST 1119	7602	3 4714 1		CAP	ZERO	SCALAR IN BUF.
1128	REF 23	LAST 1119	7603	54 004 1		TS	FBANK	
1129	REF 1		7604	1 2854 0		TCP	V/SC2	
1130			7605	0 0006 1	DV/SC	EXTEND		
1131	REF 66	LAST 1120	7606	5 0116 1		INDEX	ADDRWD	
1132			7607	3 0003 1		DCA	2	
1133	REF 416	LAST 1119	7610	52 160 1		DXCH	MPAC +3	
1134			7611	0 0006 1		EXTEND		
1135	REF 67	LAST 1120	7612	5 0116 1		INDEX	ADDRWD	
1136			7613	3 0005 1		DCA	4	
1137	REF 417	LAST 1120	7614	52 162 0		DXCH	MPAC +5	
1138	REF 135	LAST 1094	7615	4 4712 0		CS	ONE	CHANGE MODE TO VECTOR.
1139	REF 18	LAST 1120	7616	54 163 1		TS	MODE	
1140			7617	0 0006 1		EXTEND		
1141	REF 68	LAST 1120	7620	5 0116 1		INDEX	ADDRWD	
1142			7621	3 0001 0		DCA	0	
1143	REF 418	LAST 1120	7622	52 155 1		DXCH	MPAC	
1144	REF 1		7623	1 7601 0		TCP	V/SC1	FINISH PROLOGUE AT COMMON SECTION.



L INTERPRETER

USER=3 PAGE NO. 45 E3 S3

P1145 SIGN AND COMPLEMENT INSTRUCTIONS.

1146	REF	89	LAST	1120	7624	50	116	1	SIGN	INDEX	ADDRWD
1147					7625	10	000	0		CCS	0
1148	REF	24	LAST	1119	7626	1	6030	0		TCP	DANZIG
1149					7627	1	7631	0		TCP	+2
1150	REF	2	LAST	1068	7630	1	7637	0		TCP	COMP
1151	REF	70	LAST	1121	7631	50	116	1		INDEX	ADDRWD
1152					7632	10	001	1	CCSL	CCS	1
1153	REF	25	LAST	1121	7633	1	6030	0		TCP	DANZIG
1154	REF	26	LAST	1121	7634	1	6030	0		TCP	DANZIG
1155	REF	3	LAST	1121	7635	1	7637	0		TCP	COMP
1156	REF	27	LAST	1121	7636	1	6030	0		TCP	DANZIG
1157					7637	0	0006	1	COMP	EXTEND	
1158	REF	419	LAST	1120	7640	4	0155	1		DCS	MPAC
1159	REF	420	LAST	1121	7641	52	155	1		DXCH	MPAC
1160	REF	19	LAST	1120	7642	10	163	1		CCS	MODE
1161	REF	1			7643	1	7654	0		TCP	DCOMP
1162	REF	2	LAST	1121	7644	1	7654	0		TCP	DCOMP
1163					7645	0	0006	1		EXTEND	
1164	REF	421	LAST	1121	7646	4	0160	1		DCS	MPAC +3
1165	REF	422	LAST	1121	7647	52	160	1		DXCH	MPAC +3
1166					7650	0	0006	1		EXTEND	
1167	REF	423	LAST	1121	7651	4	0162	0		DCS	MPAC +5
1168	REF	424	LAST	1121	7652	52	162	0		DXCH	MPAC +5
1169	REF	28	LAST	1121	7653	1	6030	0		TCP	DANZIG
1170	REF	425	LAST	1121	7654	4	0156	1	DCOMP	CS	MPAC +2
1171	REF	426	LAST	1121	7655	54	156	1		TS	MPAC +2
1172	REF	29	LAST	1121	7656	1	6030	0		TCP	DANZIG

CALL COMP INSTRUCTION IF WORD AT X IS
NEGATIVE NON-ZERO.

DO THE COMPLEMENT.

COMPLEMENT DP MPAC IN EVERY CASE.

EITHER COMPLEMENT MPAC +3 OR THE REST OF
THE VECTOR ACCUMULATOR.

VECTOR COMPLEMENT.



L INTERPRETER

USER=3 PAGE NO. 46 E3 53

P1173 THE FOLLOWING SHORT SHIFT CODES REQUIRE NO ADDRESS WORD

R1174	1. SR1 TO SR4	SCALAR SHIFT RIGHT.
R1175	2. SR1R TO SR4R	SCALAR SHIFT RIGHT AND ROUND.
R1176	3. SL1 TO SL4	SCALAR SHIFT LEFT.
R1177	4. SL1R TO SL4R	SCALAR SHIFT LEFT AND ROUND.
R1178	5. VSR1 TO VSR8	VECTOR SHIFT RIGHT (ALWAYS ROUNDS).
R1179	6. VSL1 TO VSL8	VECTOR SHIFT LEFT (NEVER ROUNDS).

R1180 THE FOLLOWING CODES REQUIRE AN ADDRESS WHICH MAY BE INDEXED*

R1181	1. SR	SCALAR SHIFT RIGHT.
R1182	2. SRR	SCALAR SHIFT RIGHT AND ROUND.
R1183	3. SL	SCALAR SHIFT LEFT.
R1184	4. SLR	SCALAR SHIFT LEFT AND ROUND.
R1185	5. VSR	VECTOR SHIFT RIGHT.
R1186	6. VSL	VECTOR SHIFT LEFT.

R1187 * IF THE ADDRESS IS INDEXED, AND THE INDEX MODIFICATION RESULTS IN A NEGATIVE SHIFT COUNT, A SHIFT OF THE
R1189 ABSOLUTE VALUE OF THE COUNT IS DONE IN THE OPPOSITE DIRECTION.

1190			00,2017		BANK	00
1191	REF	2	LAST 1088 TO 1089	15	15*	COUNT 00/INTER
1192	REF	36	LAST 1113	00,2017	3 6211 0	SHORTT CAP SIX
1193	REF	29	LAST 1093	00,2020	7 0020 1	MASK CYR
1194	REF	20	LAST 1081	00,2021	54 021 0	TS SR
1195	REF	30	LAST 1122	00,2022	10 020 1	CCS CYR
1196	REF	1		00,2023	1 2101 1	TCF TSSL
1197				00,2024	00024 1	SRDDV DEC 20
1198	REF	21	LAST 1122	00,2025	50 021 1	TSSR INDEX SR
1199	REF	63	LAST 1010	00,2026	3 4675 1	CAP BIT14
1200	REF	13	LAST 1111	00,2027	54 135 1	TS MPTEMP
1201	REF	31	LAST 1122	00,2030	10 020 1	CCS CYR
1202	REF	1		00,2031	0 2050 0	RIGHTR TC MPACSRND
1203	REF	4	LAST 1113	00,2032	1 6027 0	TCF NEWMODE
1204	REF	14	LAST 1122	00,2033	3 0135 0	MPACSHR CA MPTEMP
1205				00,2034	0 0006 1	EXTEND
1206	REF	427	LAST 1121	00,2035	7 0156 1	MP MPAC +2
1207	REF	428	LAST 1122	00,2036	54 156 1	+3 TS MPAC +2
1208	REF	15	LAST 1122	00,2037	3 0135 0	CA MPTEMP
1209				00,2040	0 0006 1	EXTEND

SCALAR SHORT SHIFTS COME HERE. THE SHIFT COUNT-1 IS NOW IN BITS 2-3 OF CYR. THE ROUNDING BIT IS IN BIT1 AT THIS POINT.

SEE IF RIGHT OR LEFT SHIFT DESIRED. SHIFT LEFT.

MPTEMP SETTING FOR SR BEFORE DOV.

GET SHIFTING BIT.

SEE IF A ROUND IS DESIRED. YES - SHIFT RIGHT AND ROUND. SET MODE TO DP (C(A) = 0). DO A TRIPLE PRECISION SHIFT RIGHT.

(EXIT FROM SORT AND ABVAL).

L INTERPRETER

USER'S PAGE NO. 47 E3 S3

1210	REF 429	LAST 1122	00,2041	7 0154 0	MP	MPAC
1211	REF 430	LAST 1123	00,2042	52 155 1	DXCH	MPAC
1212	REF 16	LAST 1122	00,2043	3 0135 0	CA	MPTMP
1213			00,2044	0 0008 1	EXTEND	
1214	REF 162	LAST 1118	00,2045	7 0001 1	MP	L
1215	REF 431	LAST 1123	00,2046	20 156 1	DAS	MPAC +1
1216	REF 30	LAST 1121	00,2047	1 6030 0	TCF	DANZIG

SHIFT MAJOR PART INTO A,L AND PLACE IN MPAC,+1.

ORIGINAL C(MPAC +1).
GUARANTEED NO OVERFLOW.

R1217 MPAC SHIFT RIGHT AND ROUND SUBROUTINES.

1218	REF 432	LAST 1123	00,2050	3 0156 0	MPACSRND	CA	MPAC +2
1219			00,2051	0 0008 1	EXTEND		
1220	REF 17	LAST 1123	00,2052	7 0135 1	MP	MPTMP	
1221	REF 433	LAST 1123	00,2053	56 155 0	XCH	MPAC +1	
1222			00,2054	0 0008 1	EXTEND		
1223	REF 18	LAST 1123	00,2055	7 0135 1	MP	MPTMP	
1224	REF 434	LAST 1123	00,2056	56 155 0	XCH	MPAC +1	
1225	REF 183	LAST 1123	00,2057	6 0001 0	AD	L	
1226			00,2060	6 0000 1	VSHR2	DOUBLE	
1227	REF 435	LAST 1123	00,2061	54 156 1	TS	MPAC +2	
1228			00,2062	1 2064 0	TCF	+2	
1229	REF 436	LAST 1123	00,2063	26 155 1	ADS	MPAC +1	
1230	REF 221	LAST 1120	00,2064	3 4714 1	CAP	ZERO	
1231	REF 437	LAST 1123	00,2065	54 156 1	TS	MPAC +2	
1232	REF 438	LAST 1123	00,2066	56 154 1	XCH	MPAC	
1233			00,2067	0 0008 1	EXTEND		
1234	REF 19	LAST 1123	00,2070	7 0135 1	MP	MPTMP	
1235	REF 439	LAST 1123	00,2071	20 155 1	DAS	MPAC	
1236	REF 257	LAST 1118	00,2072	0 0002 0	TC	Q	
1237	REF 20	LAST 1123	00,2073	3 0135 0	VSHRRND	CA	MPTMP
1238			00,2074	0 0008 1	EXTEND		
1239	REF 440	LAST 1123	00,2075	7 0155 1	MP	MPAC +1	
1240	REF 441	LAST 1123	00,2076	54 155 1	TS	MPAC +1	
1241	REF 184	LAST 1123	00,2077	56 001 0	XCH	L	
1242	REF 1		00,2100	1 2080 1	TCF	VSHR2	

WE HAVE TO DO ALL THREE MULTIPLIES SINCE MPAC +1 AND MPAC +2 MIGHT HAVE SIGN DISAGREEMENT WITH A SHIFT RIGHT OF 1.

TRIAL MINOR PART.

(FINISH VECTOR COMPONENT SHIFT RIGHT AND ROUND.

GUARANTEED NO OVERFLOW.

SETTING TO ZERO SO FOLLOWING DAS WORKS.

AGAIN NO OVERFLOW.

ENTRY TO SHIFT RIGHT AND ROUND MPAC WHEN MPAC CONTAINS A VECTOR COMPONENT.

GO ADD ONE IF NECESSARY AND FINISH.

L INTERPRETER

USER'S PAGE NO. 48 E3 53

P1243 ROUTINE FOR SHORT SCALAR SHIFT LEFT (AND MAYBE ROUND).

1244	REF	22	LAST 1122	00,2101	3 0021 1	TSSL	CA	SR
1245	REF	21	LAST 1123	00,2102	54 135 1	+1	TS	MPTEMP
1246				00,2103	0 0008 1	+2	EXTEND	
1247	REF	442	LAST 1123	00,2104	3 0158 0		DCA	MPAC +1
1248	REF	443	LAST 1124	00,2105	20 158 1		DAS	MPAC +1
1249	REF	444	LAST 1124	00,2106	6 0154 1		AD	MPAC
1250	REF	445	LAST 1124	00,2107	6 0154 1		AD	MPAC
1251	REF	446	LAST 1124	00,2110	54 154 0		TS	MPAC
1252				00,2111	1 2113 1		TCP	+2
1253	REF	4	LAST 1108	00,2112	54 121 1		TS	OVFIND
A1254								
1255	REF	22	LAST 1124	00,2113	10 135 1		CCS	MPTEMP
1256	REF	2	LAST 1122	00,2114	1 2102 1		TCP	TSSL +1
1257	REF	32	LAST 1122	00,2115	10 020 1		CCS	CYR
1258	REF	2	LAST 1119	00,2116	0 7105 1	ROUND	TC	ROUND SUB
1259	REF	31	LAST 1123	00,2117	1 6030 0		TCP	DANZIG
1260	REF	32	LAST 1124	00,2120	1 6030 0		TCP	DANZIG

GET SHIFT COUNT FOR SR.

ENTRY HERE FROM SL FOR SCALARS.
SHIFTING LEFT ONE PLACE AT A TIME IS
FASTER THAN DOING THE WHOLE SHIFT WITH
MULTIPLIES ASSUMING THAT FREQUENCY OF
SHIFT COUNTS GOES DOWN RAPIDLY AS A
FUNCTION OF THEIR MAGNITUDE.

OVERFLOW. (LEAVES OVERFLOW-CORRECTED
RESULT ANYWAY).
LOOP ON DECREMENTED SHIFT COUNT.

SEE IF ROUND WANTED.
YES - ROUND AND EXIT.
SL LEAVES A ZERO IN CYR FOR NO ROUND.
NO - EXIT IMMEDIATELY.

L INTERPRETER

USER'S PAGE NO. 49 E3 S3

P1261 VECTOR SHIFTING ROUTINES.

1262	REF	3	LAST	726	00,2121	3 4716 0	SHORTV	CAP	LOW3
1263	REF	33	LAST	1124	00,2122	7 0020 1		MASK	CYR
1264	REF	23	LAST	1124	00,2123	54 135 1		TS	MPTMP
1265	REF	34	LAST	1125	00,2124	10 020 1		CCS	CYR
1266	REF	1			00,2125	1 2145 1		TCF	VSSL
1267					00,2126	00176 1	OCT176	OCT	176
1268	REF	24	LAST	1125	00,2127	50 135 0	VSSR	INDEX	MPTMP
1269	REF	64	LAST	1122	00,2130	3 4675 1		CAP	BIT14
1270	REF	25	LAST	1125	00,2131	54 135 1		TS	MPTMP
1271	REF	1			00,2132	0 2073 1		TC	VSHRND
1272	REF	447	LAST	1124	00,2133	52 155 1		DXCH	MPAC
1273	REF	446	LAST	1125	00,2134	52 160 1		DXCH	MPAC +3
1274	REF	449	LAST	1125	00,2135	52 155 1		DXCH	MPAC
1275	REF	2	LAST	1125	00,2136	0 2073 1		TC	VSHRND
1276	REF	450	LAST	1125	00,2137	52 155 1		DXCH	MPAC
1277	REF	451	LAST	1125	00,2140	52 162 0		DXCH	MPAC +5
1278	REF	452	LAST	1125	00,2141	52 155 1		DXCH	MPAC
1279	REF	3	LAST	1125	00,2142	0 2073 1		TC	VSHRND
1280	REF	1			00,2143	1 7367 0		TCF	VRODATEX

SAVE 3 BIT SHIFT COUNT - 1 WITHOUT EDITING CYR.

SEE IF LEFT OR RIGHT SHIFT.
VECTOR SHIFT LEFT.
USED IN PROCESSED SHIFTS WITH - COUNT.

(ENTRY FROM SR). PICK UP SHIFTING BIT.
MPTMP CONTAINS THE SHIFT COUNT - 1.

SHIFT X COMPONENT.

SWAP X AND Y COMPONENTS.

SHIFT Y COMPONENT.

SWAP Y AND Z COMPONENTS.

SHIFT Z COMPONENT.

RESTORE COMPONENTS TO PROPER PLACES.



L INTERPRETER

USER'S PAGE NO. 50 E3 S3

P1281 VECTOR SHIFT LEFT - DONE ONE PLACE AT A TIME.

1282	REP 26	LAST 1125	00,2144 54 135 1 -1	TS	MPTMP
1283					SHIFTING LOOP.
1284	REP 453	LAST 1125	00,2145 0 0006 1 VSSL	EXTEND	
1285	REP 454	LAST 1126	00,2146 3 0155 0	DCA	MPAC
1286			00,2147 20 155 1	DAS	MPAC
1287			00,2150 0 0006 1	EXTEND	
1288	REP 3	LAST 1108	00,2151 1 2153 0	BZF	+2
			00,2152 0 6766 0	TC	OVERFLOW
1289				EXTEND	
1290	REP 455	LAST 1126	00,2153 0 0006 1	DCA	MPAC +3
1291	REP 456	LAST 1126	00,2154 3 0180 0	DAS	MPAC +3
1292			00,2155 20 160 1	EXTEND	
1293			00,2156 0 0006 1	BZF	+2
1294	REP 4	LAST 1118	00,2157 1 2161 1	TC	OVERFLOW
			00,2160 0 6763 0		
1295				EXTEND	
1296	REP 457	LAST 1126	00,2161 0 0006 1	DCA	MPAC +5
1297	REP 458	LAST 1126	00,2162 3 0162 1	DAS	MPAC +5
1298			00,2163 20 162 0	EXTEND	
1299			00,2164 0 0006 1	BZF	+2
1300	REP 4	LAST 1117	00,2165 1 2167 1	TC	OVERFLOW
			00,2166 0 6760 0		
1301	REP 27	LAST 1126	00,2167 10 135 1	CCS	MPTMP
1302	REP 2	LAST 1125	00,2170 1 2144 0	TCP	VSSL -1
1303	REP 33	LAST 1124	00,2171 1 6030 0	TCP	DANZIG

LOOP ON DECREMENTED SHIFT COUNTER.

EXIT.

L INTERPRETER

USER'S PAGE NO. 51 E3 S3

P1304 TSLC - TRIPLE SHIFT LEFT AND COUNT. SHIFTS MPAC LEFT UNTIL GREATER THAN .5 IN MAGNITUDE, LEAVING
R1306 THE COMPLEMENT OF THE NUMBER OF SHIFTS REQUIRED IN X.

1307	REP	28	LAST	1128	00,2172	54 135 1	TSLC2	TS	MPTEMP	START BY ZEROING SHIPT COUNT (IN A NOW).
1308	REP	2	LAST	1111	00,2173	0 6672 1		TC	BRANCH	EXIT WITH NO SHIPTING IF ARGUMENT ZERO.
1309					00,2174	1 2176 1		TCP	+2	
1310	REP	1			00,2175	1 2212 0		TCP	ENDTSLC	STORES ZERO SHIPT COUNT IN THIS CASE.
1311	REP	6	LAST	663	00,2176	0 7226 0		TC	TPACR2E	MAY CAUSE UPSHIPT OF ONE EXTRA PLACE.
1312	REP	459	LAST	1128	00,2177	3 0154 1		CA	MPAC	BEGIN NORMALIZATION LOOP.
1313	REP	1			00,2200	1 2207 1		TCP	TSLCTEST	
1314	REP	29	LAST	1127	00,2201	24 135 0	TSLCLOOP	INCR	MPTEMP	INCREMENT SHIPT COUNTER.
1315					00,2202	0 0006 1		EXTEND		
1316	REP	460	LAST	1127	00,2203	3 0156 0		DCA	MPAC +1	
1317	REP	461	LAST	1127	00,2204	20 156 1		DAS	MPAC +1	
1318	REP	462	LAST	1127	00,2205	6 0154 1		AD	MPAC	
1319	REP	463	LAST	1127	00,2206	26 154 0		ADS	MPAC	
1320					00,2207	6 0000 1	TSLCTEST	DOUBLE		SEE IF (ANOTHER) SHIPT IS REQUIRED.
1321					00,2210	54 000 0		OVSX		
1322	REP	1			00,2211	1 2201 1		TCP	TSLCLOOP	YES - INCREMENT COUNT AND SHIPT AGAIN.
1323	REP	30	LAST	1127	00,2212	4 0135 1	ENDTSLC	CS	MPTEMP	
1324	REP	1			00,2213	1 6572 0		TCP	STORE1	STORE SHIPT COUNT AND RETURN TO DANZIG.



L INTERPRETER

USER=8 PAGE NO. 52 E3 S3

P1325 THE FOLLOWING ROUTINES PROCESSES THE GENERAL SHIFT INSTRUCTIONS SR, SRR, SL, AND SLR.
R1327 THE GIVEN ADDRESS IS DECODED AS FOLLOWS:

R1328 BITS 1-7 SHIFT COUNT (SUBADDRESS) LESS THAN 125 DECIMAL.
R1329 BIT 8 PSEUDO SIGN BIT (DETECTS CHANGE IN SIGN IN INDEXED SHIFTS).
R1331 BIT 9 0 FOR LEFT SHIFT, AND 1 FOR RIGHT SHIFT.
R1332 BIT 10 1 FOR TERMINAL ROUND ON SCALAR SHIFTS, 0 OTHERWISE.
R1333 BITS 11-13 0.
R1334 BIT 14 1.
R1335 BIT 15 0.

R1336 THE ABOVE ENCODING IS DONE BY THE YUL SYSTEM.

1337	REF	71	LAST	1121	00,2214	7 0116 0	GENSHIFT MASK	ADDRWD	GET SHIFT COUNT, TESTING FOR ZERO.
1338	REF	299	LAST	1118	00,2215	10 000 0	CCS	A	(ARRIVES WITH C(A) = LOW7).
1339	REF	1			00,2216	1 2224 0	TCP	GENSHIFT2	IF NON-ZERO, PROCEED WITH DECREMENTED CT
1340	REF	33	LAST	701	00,2217	3 4701 0	CAP	BIT10	
1341	REF	72	LAST	1128	00,2220	7 0116 0	MASK	ADDRWD	ZERO SHIFT COUNT. NO SHIFTS NEEDED BUT
1342	REF	300	LAST	1128	00,2221	10 000 0	CCS	A	WE MIGHT HAVE TO ROUND MPAC ON SLR AND
1343	REF	3	LAST	1124	00,2222	0 7105 1	TC	ROUND SUB	SRR (SCALAR ONLY).
1344	REF	34	LAST	1128	00,2223	1 8030 0	TCP	DANZIG	
1345	REF	31	LAST	1127	00,2224	54 135 1	GENSHIFT2 TS	MPTEMP	DECREMENTED SHIFT COUNT TO MPTEMP.
1346	REF	26	LAST	1075	00,2225	3 4703 1	CAP	BIT8	TEST MEANING OF LOW SEVEN BIT COUNT IN
1347					00,2226	0 0006 1	EXTEND		MPTEMP NOW.
1348	REF	73	LAST	1128	00,2227	7 0116 0	MP	ADDRWD	
1349	REF	1			00,2230	7 8214 1	MASK	LOW2	JUMPS ON SHIFT DIRECTION (BIT8) AND
1350	REF	301	LAST	1128	00,2231	50 000 1	INDEX	A	
1351					00,2232	1 2233 0	TCP	+1	ORIGINAL SHIFT DIRECTION (BIT 9).
1352	REF	1			00,2233	1 2332 0	TCP	RIGHT-	NEGATIVE SHIFT COUNT FOR SL OR SLR.
1353	REF	1			00,2234	1 2342 1	TCP	LEFT	SL OR SLR.
1354	REF	1			00,2235	1 2336 1	TCP	LEFT-	NEGATIVE SHIFT COUNT WITH SR OR SRR.

L INTERPRETER

USER=8 PAGE NO. 53 E3 83

P1355 GENERAL SHIFT RIGHT.

1356	REF	20	LAST 1121	00,2238	10 163 1	RIGHT	CCS	MODE	
1357	REF	1		00,2237	1 2277 0		TCF	GENSCR	
1358	REF	2	LAST 1129	00,2240	1 2277 0		TCF	GENSCR	
1359	REF	32	LAST 1128	00,2241	3 0135 0		CA	MPTMP	
1360	REF	1		00,2242	6 3730 0	VRIGHT2	AD	NEG12	
1361				00,2243	0 0006 1		EXTEND		
1362	REF	1		00,2244	6 2127 1		BZMF	VSSR	
1363	REF	25	LAST 1118	00,2245	6 7716 0		AD	NEGONE	
1364	REF	33	LAST 1129	00,2246	54 135 1		TS	MPTMP	
1365	REF	222	LAST 1123	00,2247	3 4714 1		CAP	ZERO	
1366	REF	165	LAST 1123	00,2250	54 001 1		TS	L	
1367	REF	464	LAST 1127	00,2251	56 154 1		XCH	MPAC	
1368	REF	465	LAST 1129	00,2252	56 155 0		XCH	MPAC +1	
1369	REF	1		00,2253	0 2272 1		TC	SETROUND	
1370	REF	466	LAST 1129	00,2254	20 155 1		DAS	MPAC	
A1371									
1372	REF	467	LAST 1129	00,2255	56 157 1		XCH	MPAC +3	
1373	REF	468	LAST 1129	00,2256	56 160 0		XCH	MPAC +4	
1374	REF	2	LAST 1129	00,2257	0 2272 1		TC	SETROUND	
1375	REF	469	LAST 1129	00,2260	20 160 1		DAS	MPAC +3	
1376	REF	470	LAST 1129	00,2261	56 161 1		XCH	MPAC +5	
1377	REF	471	LAST 1129	00,2262	56 162 1		XCH	MPAC +6	
1378	REF	3	LAST 1129	00,2263	0 2272 1		TC	SETROUND	
1379	REF	472	LAST 1129	00,2264	20 162 0		DAS	MPAC +5	
1380	REF	34	LAST 1129	00,2265	10 135 1		CCS	MPTMP	
1381	REF	35	LAST 1129	00,2266	54 135 1		TS	MPTMP	
1382	REF	1		00,2267	1 2242 0		TCF	VRIGHT2	
1383				00,2270	04604 1	BIASLO	DEC	.2974 B-1	
1384	REF	35	LAST 1128	00,2271	1 6030 0		TCF	DANZIG	
1385				00,2272	6 0000 1	SETROUND	DOUBLE		
1386	REF	473	LAST 1129	00,2273	54 156 1		TS	MPAC +2	
1387	REF	223	LAST 1129	00,2274	3 4714 1		CAP	ZERO	
1388	REF	166	LAST 1129	00,2275	56 001 0		XCH	L	
1389	REF	258	LAST 1123	00,2276	0 0002 0		TC	0	

SEE IF VECTOR OR SCALAR.

SEE IF SHIFT COUNT LESS THAN 14D.

IF SO, BRANCH AND SHIFT IMMEDIATELY.

IF NOT, REDUCE MPTMP BY A TOTAL OF 14, AND DO A SHIFT RIGHT AND ROUND BY 14. THE ROUND AT THIS STAGE MAY INTRODUCE A ONE BIT ERROR IN A SHIFT RIGHT 15D.

X COMPONENT NOW SHIFTED, SO MAKE UP THE ROUNDING QUANTITY (0 IN A AND 0 OR +-1 IN L).

REPEAT THE ABOVE PROCESS FOR Y AND Z.

NO OVERFLOW ON THESE ADDS.

SEE IF DONE, DOING FINAL DECREMENT.

SORT CONSTANT

MAKES UP ROUNDING QUANTITY FROM ARRIVING C(A). L IS ZERO INITIALLY.

RETURN AND DO THE DAS, RESETTNG L TO 0.

L INTERPRETER

USER'S PAGE NO. 54 E3 S3

P1390 PROCESS SR AND SRR FOR SCALARS.

1391	REF 36	LAST 1129	00,2277	3 0135 0	GENSCR	CA	MPTMP
1392	REF 2	LAST 1129	00,2300	6 3730 0	+1	AD	NEG12
1393			00,2301	0 0006 1		EXTEND	
1394	REF 1		00,2302	6 2322 0		BZMP	DOSSHPT
1395	REF 26	LAST 1129	00,2303	6 7716 0	+4	AD	NEONE
1396	REF 37	LAST 1130	00,2304	54 135 1		TS	MPTMP
1397	REF 224	LAST 1129	00,2305	3 4714 1		CAP	ZERO
1398	REF 474	LAST 1129	00,2306	56 154 1		XCH	MPAC
1399	REF 475	LAST 1130	00,2307	56 155 0		XCH	MPAC +1
1400	REF 476	LAST 1130	00,2310	54 156 1		TS	MPAC +2
1401	REF 36	LAST 1130	00,2311	10 135 1		CCS	MPTMP
1402	REF 39	LAST 1130	00,2312	54 135 1		TS	MPTMP
1403	REF 3	LAST 1129	00,2313	0 2300 0		TC	GENSCR +1
1404			00,2314	22650 1	SLOPEHI	DEC	.5864
1405	REF 34	LAST 1128	00,2315	3 4701 0		CAP	BIT10
1406	REF 74	LAST 1126	00,2316	7 0116 0		MASK	ADDRWD
1407	REF 302	LAST 1126	00,2317	10 000 0		CCS	A
1408	REF 4	LAST 1126	00,2320	0 7105 1		TC	ROUND SUB
1409	REF 36	LAST 1129	00,2321	1 6030 0		TCP	DANZIG
1410	REF 40	LAST 1130	00,2322	50 135 0	DOSSHPT	INDEX	MPTMP
1411	REF 65	LAST 1125	00,2323	3 4675 1		CAP	BIT14
1412	REF 41	LAST 1130	00,2324	54 135 1		TS	MPTMP
1413	REF 35	LAST 1130	00,2325	3 4701 0		CAP	BIT10
1414	REF 75	LAST 1130	00,2326	7 0116 0		MASK	ADDRWD
1415	REF 303	LAST 1130	00,2327	10 000 0		CCS	A
1416	REF 1		00,2330	1 2031 0		TCP	RIGHTR
1417	REF 1		00,2331	1 2033 1		TCP	MPACSHR

SEE IF THE ORIGINAL SHIPT COUNT WAS LESS THAN 14D.

DO THE SHIPT IMMEDIATELY IF SO.

IF NOT, DECREMENT SHIPT COUNT BY 14D AND SHIPT MPAC RIGHT 14 PLACES.

SEE IF FINISHED, DO FINAL DECREMENT.

SOFT CONSTANT.
FINISHED WITH SHIPT. SEE IF ROUND WANTED.

DO SO AND/OR EXIT.

PICK UP SHIPTING BIT.

SEE IF TERMINAL ROUND DESIRED.

YES.
JUST SHIPT RIGHT.

L INTERPRETER

USER'S PAGE NO. 55

E3 S3

P1416 PROCESS THE RIGHT- (SL(R) WITH A NEGATIVE COUNT), LEFT-, AND LEFT OPTIONS.

1420	REP	42	LAST 1130	00,2332	4 0135 1	RIGHT-	CS	MPTEMP	GET ABSOLUTE VALUE - 1 OF SHIFT COUNT
1421	REP	1		00,2333	6 2128 0		AD	OCT178	UNDERSTANDING THAT BITS (PSEUDO-SIGN)
1422	REP	43	LAST 1131	00,2334	54 135 1		TS	MPTEMP	WAS 1 INITIALLY.
1423	REP	1		00,2335	1 2236 0		TCP	RIGHT	DO NORMAL SHIFT RIGHT.
1424	REP	2	LAST 1131	00,2336	4 2128 1	LEFT-	CS	OCT178	SAME PROLOGUE TO LEFT FOR INDEXED RIGHT
1425	REP	44	LAST 1131	00,2337	6 0135 0		AD	MPTEMP	SHIFTS WHOSE NET SHIFT COUNT IS NEGATIVE
1426				00,2340	4 0000 0		COM		
1427	REP	45	LAST 1131	00,2341	54 135 1		TS	MPTEMP	
1428	REP	21	LAST 1129	00,2342	10 163 1	LEFT	CCS	MODE	SINCE LEFT SHIFTING IS SOME ONE PLACE AT
1429	REP	1		00,2343	1 2348 0		TCP	GENSCL	A TIME, NO COMPARISON WITH 14 NEED BE
1430	REP	2	LAST 1131	00,2344	1 2348 0		TCP	GENSCL	DONE. FOR SCALARS, SEE IF TERMINAL ROUND
1431	REP	3	LAST 1128	00,2345	1 2145 1		TCP	VSSL	DESIRED. FOR VECTORS, SHIFT IMMEDIATELY.
1432	REP	76	LAST 1130	00,2346	4 0116 0	GENSCL	CS	ADDRWD	PUT ROUNDING BIT (BIT 10 OF ADDRWD) INTO
1433				00,2347	0 0008 1		EXTEND		BIT 15 OF CYR WHERE THE ROUNDING BIT OF
1434	REP	43	LAST 1034	00,2350	7 4705 0		MP	BITS	A SHORT SHIFT LEFT WOULD BE
1435	REP	35	LAST 1125	00,2351	54 020 1		TS	CYR	
1436	REP	3	LAST 1124	00,2352	1 2103 0		TCP	TSSL +2	DO THE SHIFT.



L INTERPRETER

USER-S PAGE NO. 56 E3 S3

P1437 SCALAR DIVISION INSTRUCTIONS, DDV AND DDV, ARE EXECUTED HERE. AT THIS POINT, THE DIVIDEND IS IN MPAC
R1439 AND THE DIVISOR IN BUP.

1440	REP	136	LAST 1120	00,2353	4 4712 0	DDV/DDV	CS	ONE	INITIALIZATION.
1441	REP	1		00,2354	54 136 1		TS	DVSIGN	+1 FOR POSITIVE QUOTIENT - -0 FOR NEG.
1442	REP	1		00,2355	54 137 0		TS	DVNORMCT	DIVIDEND NORMALIZATION COUNT.
1443	REP	1		00,2356	54 140 0		TS	MAXOVSW	NEAR-ONE DIVIDE FLAG.
1444	REP	55	LAST 1120	00,2357	10 130 1		CCS	BUP	FORCE BUP POSITIVE WITH THE MAJOR PART
1445	REP	1		00,2360	1 2516 0		TCP	BUPPOS	NON-ZERO.
1446	REP	1		00,2361	1 2363 1		TCP	+2	
1447	REP	1		00,2362	1 2531 0		TCP	BUPNEG	
1448	REP	477	LAST 1130	00,2363	54 156 1	BUPZERO	TS	MPAC +2	ZERO THIS.
1449	REP	9	LAST 1127	00,2364	0 7226 0		TC	TPAGREE	FORCE SIGN AGREEMENT BEFORE OVERFLOW
1450	REP	478	LAST 1132	00,2365	10 154 0		CCS	MPAC	TEST TO SEE IF MPAC NON-ZERO. (TOO BIG)
1451	REP	1		00,2366	1 2414 0		TCP	OVP+	MAJOR PART OF DIVIDEND IS POSITIVE NON-0
1452	REP	1		00,2367	1 2371 1		TCP	+2	
1453	REP	2	LAST 1132	00,2370	1 2413 1		TCP	OVP+ -1	MAJOR PART OF DIVIDEND IS NEG. NON-ZERO
1454	REP	56	LAST 1132	00,2371	56 131 1		XCH	BUP +1	SHIFT DIVIDEND AND DIVISOR LEFT 14.
1455	REP	57	LAST 1132	00,2372	56 130 0		XCH	BUP	
1456	REP	479	LAST 1132	00,2373	56 155 0		XCH	MPAC +1	
1457	REP	480	LAST 1132	00,2374	56 154 1		XCH	MPAC	
1458	REP	58	LAST 1132	00,2375	10 130 1		CCS	BUP	TRY AGAIN ON FORMER MINOR PART.
1459	REP	1		00,2376	1 2422 0		TCP	BUP+	
1460	REP	1		00,2377	1 2401 1		TCP	+2	OVERFLOW ON ZERO DIVISOR.
1461	REP	1		00,2400	1 2416 1		TCP	BUP-	
1462	REP	481	LAST 1132	00,2401	4 0154 0		CS	MPAC	SIGN OF MPAC DETERMINES SIGN OF RESULT.
1463	REP	1		00,2402	0 0006 1	SGNDVOVF	EXTEND		
1464	REP	1		00,2403	6 2405 1		BZMF	+2	
1465	REP	2	LAST 1132	00,2404	24 136 0		INCR	DVSIGN	NEGMAX IN MPAC PERHAPS.
1466	REP	30	LAST 1111	00,2405	3 4672 0	DVOVF	CAP	POS MAX	ON DIVISION OVERFLOW OF ANY SORT, SET
1467	REP	482	LAST 1132	00,2406	54 154 0		TS	MPAC	SET DP MPAC TO +-POS MAX.
1468	REP	1		00,2407	0 2630 0		TC	FINALDV +3	
1469	REP	137	LAST 1132	00,2410	3 4712 1		CAP	ONE	SET OVERFLOW INDICATOR AND EXIT.
1470	REP	5	LAST 1124	00,2411	54 121 1		TS	OVPIND	
1471	REP	37	LAST 1130	00,2412	0 6030 1		TC	DANZIG	
1472	REP	3	LAST 1132	00,2413	24 136 0	-1	INCR	DVSIGN	
1473	REP	59	LAST 1132	00,2414	4 0131 0	OVP+	CS	BUP +1	LOAD LOWER ORDER PART OF DIVISOR.
1474	REP	1		00,2415	1 2402 1		TCP	SGNDVOVF	GET SIGN OF RESULT.
1475	REP	1		00,2416	0 0006 1	BUP-	EXTEND		IF BUP IS NEGATIVE, COMPLEMENT IT AND
1476	REP	60	LAST 1132	00,2417	4 0131 0		DCS	BUP	MAINTAIN DVSIGN FOR FINAL QUOTIENT SIGN.
1477	REP	61	LAST 1132	00,2420	52 131 0		DXCH	BUP	
1478	REP	4	LAST 1132	00,2421	24 136 0		INCR	DVSIGN	NOW -0.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1133

L INTERPRETER

USER'S PAGE NO. 57 E3 53

1479	REF 483	LAST 1132	00,2422	10 154 0	BUF+	CCS	MPAC
1480	REF 1		00,2423	1 2437 1		TCP	MPAC+
1481			00,2424	1 2426 1		TCP	+2
1482	REF 1		00,2425	1 2433 0		TCP	MPAC-
1483	REF 484	LAST 1133	00,2426	10 155 1		CCS	MPAC +1
1484	REF 2	LAST 1133	00,2427	1 2437 1		TCP	MPAC+
1485	REF 38	LAST 1132	00,2430	1 6030 0		TCP	DANZIG
1486	REF 2	LAST 1133	00,2431	1 2433 0		TCP	MPAC-
1487	REF 39	LAST 1133	00,2432	1 6030 0		TCP	DANZIG
1488			00,2433	0 0006 1	MPAC-	EXTEND	
1489	REF 485	LAST 1133	00,2434	4 0155 1		DCS	MPAC
1490	REF 486	LAST 1133	00,2435	52 155 1		DCH	MPAC
1491	REF 5	LAST 1132	00,2436	24 136 0		INCR	DVSIGN

FORCE MPAC POSITIVE, CHECKING FOR ZERO
DIVIDEND IN THE PROCESS.

EXIT IMMEDIATELY ON ZERO DIVIDEND.

FORCE MPAC POSITIVE AS BUF IN BUF-.

NOW +1 OR -0.

L INTERPRETER

USER'S PAGE NO. 58 E3 S3

1492	REP 467	LAST 1133	00,2437	4 0154 0	MPAC+	CS	MPAC
1493	REP 27	LAST 1130	00,2440	6 7716 0		AD	NEGONE
1494	REP 62	LAST 1132	00,2441	6 0130 0		AD	BUF
1495	REP 304	LAST 1130	00,2442	10 000 0		CCS	A
1496	REP 1		00,2443	1 2505 1		TCP	DVNORM
1497			00,2444	60001 0	-1/2+2	OCT	60001
1498			00,2445	1 2446 1		TCP	+1
1499	REP 11	LAST 1116	00,2446	3 4675 1		CAP	HALF
1500			00,2447	6 0000 1		DOUBLE	
1501	REP 466	LAST 1134	00,2450	6 0155 0		AD	MPAC +1
1502	REP 469	LAST 1134	00,2451	54 155 1		TS	MPAC +1
1503	REP 225	LAST 1130	00,2452	3 4714 1		CAP	ZERO
1504	REP 31	LAST 1132	00,2453	6 4672 0		AD	POS MAX
1505	REP 490	LAST 1134	00,2454	26 154 0		ADS	MPAC
1506	REP 12	LAST 1134	00,2455	3 4675 1		CAP	HALF
1507			00,2456	6 0000 1		DOUBLE	
1508	REP 63	LAST 1134	00,2457	6 0131 1		AD	BUF +1
1509	REP 64	LAST 1134	00,2460	54 131 0		TS	BUF +1
1510	REP 226	LAST 1134	00,2461	3 4714 1		CAP	ZERO
1511	REP 32	LAST 1134	00,2462	6 4672 0		AD	POS MAX
1512	REP 65	LAST 1134	00,2463	26 130 1		ADS	BUF
1513	REP 491	LAST 1134	00,2464	4 0154 0		CS	MPAC
1514	REP 66	LAST 1134	00,2465	6 0130 0		AD	BUF
1515	REP 305	LAST 1134	00,2466	10 000 0		CCS	A
1516	REP 2	LAST 1134	00,2467	1 2505 1		TCP	DVNORM
1517	REP 13	LAST 1114	00,2470	00133 0	LBUP2	ADRES	BUF2
1518	REP 1		00,2471	1 2405 0		TCP	DVOVF
1519	REP 2	LAST 1132	00,2472	54 140 0		TS	MAXOVSW
1520	REP 492	LAST 1134	00,2473	4 0155 1		CS	MPAC +1
1521	REP 67	LAST 1134	00,2474	6 0131 1		AD	BUF +1
1522			00,2475	0 0006 1		EXTEND	
1523	REP 2	LAST 1134	00,2476	6 2405 1		BZMF	DVOVF
1524	REP 3	LAST 1134	00,2477	1 2505 1		TCP	DVNORM

CHECK FOR DIVISION OVERFLOW. IF THE MAJOR PART OF THE DIVIDEND IS LESS THAN THE MAJOR PART OF THE DIVISOR BY AT LEAST TWO, WE CAN PROCEED IMMEDIATELY WITHOUT NORMALIZATION PRODUCING A DVMAX. USED IN SORTSUB.

IF THE ABOVE DOES NOT HOLD, FORCE SIGN AGREEMENT IN NUMERATOR AND DENOMINATOR TO FACILITATE OVERFLOW AND NEAR-ONE CHECKING.

SAME FOR BUF.

CHECK MAGNITUDE OF SIGN-CORRECTED OPERANDS.

DIVIDE OK - WILL NOT BECOME MAXDV CASE.

DIVISOR NOT LESS THAN DIVIDEND - OVF.

IF THE MAJOR PARTS OF THE DIVIDEND AND DIVISOR ARE EQUAL, A SPECIAL APPROXIMATION IS USED (PROVIDED THE DIVISION IS POSSIBLE, OF COURSE).

IF NO OVERFLOW.



L INTERPRETER

USER'S PAGE NO. 59 E3 S3

1525			00,2500	0 0008 1	BUFNORM	EXTEND	
1526	REF 2	LAST 1132	00,2501	24 137 1		AUG	DVNORMCT
1527			00,2502	0 0008 1		EXTEND	
1528	REF 68	LAST 1134	00,2503	3 0131 1		DCA	BUF
1529	REF 69	LAST 1135	00,2504	20 131 0		DAS	BUF
1530	REF 70	LAST 1135	00,2505	3 0130 0	DVNORM	CA	BUF
1531			00,2506	6 0000 1		DOUBLE	
1532			00,2507	54 000 0		OVSK	
1533	REF 1		00,2510	1 2500 1		TCP	BUFNORM
1534	REF 493	LAST 1134	00,2511	52 155 1		DYCH	MPAC
1535	REF 3	LAST 1135	00,2512	50 137 1		INDEX	DVNORMCT
1536	REF 1		00,2513	0 2585 0		TC	MAXTEST
1537	REF 494	LAST 1135	00,2514	54 156 1		TS	MPAC +2
1538	REF 40	LAST 1133	00,2515	1 6030 0		TCP	DANZIG
1539	REF 306	LAST 1134	00,2516	10 000 0	BUFPPOS	CCS	A
1540	REF 2	LAST 1132	00,2517	1 2422 0		TCP	BUF+
1541	REF 71	LAST 1135	00,2520	4 0131 0		CS	BUF +1
1542			00,2521	0 0008 1		EXTEND	
1543	REF 3	LAST 1135	00,2522	6 2422 1		BZMP	BUF+
1544	REF 13	LAST 1134	00,2523	3 4675 1		CA	HALP
1545			00,2524	6 0000 1	+8	DOUBLE	
1546	REF 72	LAST 1135	00,2525	26 131 0		ADS	BUF +1
1547	REF 227	LAST 1134	00,2526	3 4714 1		CA	ZERO
1548	REF 73	LAST 1135	00,2527	54 130 1		TS	BUF
1549	REF 1		00,2530	1 2363 1		TCP	BUZZERO
1550	REF 307	LAST 1135	00,2531	10 000 0	BUFNEG	CCS	A
1551	REF 2	LAST 1132	00,2532	1 2416 1		TCP	BUF-
1552	REF 74	LAST 1135	00,2533	3 0131 1		CA	BUF +1
1553			00,2534	0 0008 1		EXTEND	
1554	REF 3	LAST 1135	00,2535	6 2416 0		BZMP	BUF-
1555	REF 14	LAST 1135	00,2536	4 4675 0		CS	HALP
1556	REF 2	LAST 1132	00,2537	1 2524 1		TCP	BUFPPOS +8

ADD -1 TO AUGMENT SHIFT COUNT AND SHIFT LEFT ONE PLACE.

SEE IF DIVISOR NORMALIZED YET.

NO - SHIFT LEFT ONE AND TRY AGAIN.

CALL DIVIDEND NORMALIZATION SEQUENCE PRIOR TO DOING THE DIVIDE.

RETURNS WITH DIVISION DONE AND C(A) = 0.

TO BUF+ IF BUF IS GREATER THAN +1.

IF BUF IS +1, FORCING SIGN AGREEMENT MAY CAUSE BUF TO BECOME ZERO. BRANCH IF SIGNS AGREE.

SIGNS DISAGREE. FORCE AGREEMENT.

TO BUF- IF BUF IS LESS THAN -1.

IF BUF IS -1, FORCING SIGN AGREEMENT MAY CAUSE BUF TO BECOME ZERO. BRANCH IF SIGNS AGREE.

SIGNS DISAGREE. FORCE AGREEMENT.

L INTERPRETER

USER-S PAGE NO. 60 E3 S3

P1557

THE FOLLOWING ARE PROLOGUES TO SHIFT THE DIVIDEND ARRIVING IN A AND L BEFORE THE DIVIDE.

1559	REP 23	LAST 1124	00,2540	22 021 1	-21D	LXCH	SR	
1560			00,2541	0 0008 1		EXTEND		
1561	REP 15	LAST 1135	00,2542	7 4875 0		MP	HALP	
1562	REP 187	LAST 1129	00,2543	56 001 0		XCH	L	
1563	REP 24	LAST 1138	00,2544	6 0021 1		AD	SR	
1564	REP 188	LAST 1138	00,2545	56 001 0		XCH	L	
1565	REP 1		00,2546	1 2571 1		TCP	GENDDV +1	
1566			00,2547	20 001 1		DDOUBL		
1567			00,2550	20 001 1		DDOUBL		
1568			00,2551	20 001 1		DDOUBL		
1569			00,2552	20 001 1		DDOUBL		
1570			00,2553	20 001 1		DDOUBL		
1571			00,2554	20 001 1		DDOUBL		
1572			00,2555	20 001 1		DDOUBL		
1573			00,2558	20 001 1		DDOUBL		
1574			00,2557	20 001 1		DDOUBL		
1575			00,2580	20 001 1		DDOUBL		
1576			00,2561	20 001 1		DDOUBL		
1577			00,2562	20 001 1		DDOUBL		
1578			00,2563	20 001 1		DDOUBL		
1579	REP 495	LAST 1135	00,2564	52 155 1		DXCH	MPAC	
1580	REP 3	LAST 1134	00,2585	10 140 0	MAXTEST	CCS	MAXDVSX	
1581			00,2566	06552 0	BIASHI	DEC	.4192 B-1	
1582	REP 1		00,2567	1 2642 1		TCP	MAXDV	

SPECIAL PROLOGUE FOR UNIT WHEN THE LENGTH OF THE ARGUMENT WAS NOT LESS THAN .5. IN THIS CASE, EACH COMPONENT MUST BE SHIFTED RIGHT ONE TO PRODUCE A HALF-UNIT VECTOR.

WITH DP DIVIDEND IN A,L.

PROLOGUE WHICH NORMALIZES THE DIVIDEND WHEN IT IS KNOWN THAT NO DIVISION OVERFLOW WILL OCCUR.

0 IF MAJORS MIGHT BE =, -1 OTHERWISE.
SORT CONSTANTS

CHECK TO SEE IF THEY ARE NOW EQUAL.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 20211111-041

20'35 OCT. 28,1966 SATRAP .007 PAGE 1136

L INTERPRETER

USER=3 PAGE NO. 62 E3 S3

1620			00,2610	0 0006 1	+DOWN	EXTEND	
1621	REF 76	LAST 1137	00,2611	60 130 0		SU	RUP
1622			00,2612	0 0006 1		EXTEND	
1623			00,2613	1 2616 0		BZF	+3
1624			00,2614	0 0006 1		EXTEND	
1625	REF 1		00,2615	6 2624 0		BZF	ENDMAXOV
1626	REF 501	LAST 1137	00,2616	24 154 1	+3	INCR	MPAC
1627	REF 2	LAST 1132	00,2617	1 2625 0		TOP	FINALDV
1628			00,2620	0 0006 1	-UP	EXTEND	
1629	REF 3	LAST 1136	00,2621	1 2630 1		BZF	FINALDV +3
1630			00,2622	0 0006 1		EXTEND	
1631	REF 502	LAST 1136	00,2623	26 154 0		DIM	MPAC
1632	REF 79	LAST 1136	00,2624	6 0130 0	ENDMAXOV	AD	RUP

IF POSITIVE, REDUCE ONLY IF NECESSARY
SINCE THE COMPENSATING INCR MIGHT CAUSE
OVERFLOW.
DONT SUBTRACT UNLESS RESULT IS POSITIVE
OR ZERO.

KEEP SUBTRACT HERE AND COMPENSATE.

IF ZERO, SET MINOR PART OF RESULT TO
ZERO.

IF NEGATIVE, ADD C TO A, SUBTRACTING ONE
TO COMPENSATE. DIM IS OK HERE SINCE THE
MAJOR PART NEVER GOES NEGATIVE.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1139

L INTERPRETER

USER=3 PAGE NO. 63 E3 53

DO DV TO OBTAIN MINOR PART OF RESULT.

1633			00,2625	22 007 0	FINALDV	ZL	
1634			00,2626	0 0006 1		EXTEND	
1635	REP 80	LAST 1138	00,2627	10 130 1		DV	BUP
1636	REP 503	LAST 1138	00,2630	54 155 1	+3	TS	MPAC +1
1637	REP 6	LAST 1133	00,2631	10 138 1		CCS	DVSIGN
1638	REP 259	LAST 1129	00,2632	0 0002 0		TC	Q
1639	REP 260	LAST 1139	00,2633	0 0002 0		TC	Q
1640	REP 281	LAST 1139	00,2634	0 0002 0		TC	Q
1641			00,2635	0 0006 1		EXTEND	
1642	REP 504	LAST 1139	00,2636	4 0155 1		DCS	MPAC
1643	REP 505	LAST 1139	00,2637	52 155 1		DXCH	MPAC
1644	REP 228	LAST 1135	00,2640	3 4714 1		CAP	ZERO
1645	REP 262	LAST 1139	00,2641	0 0002 0		TC	Q

LEAVE RESULT POSITIVE UNLESS C(DVSIGN)=-
-0.

SO WE ALWAYS RETURN WITH C(A) = 0.



L INTERPRETER

USER'S PAGE NO. 64 E3 S3

R1646 IF THE MAJOR PARTS OF THE DIVISOR AND DIVIDEND ARE EQUAL, BUT THE MINOR PARTS ARE SUCH THAT THE
R1648 DIVIDEND IS STRICTLY LESS THAN THE DIVISOR IN MAGNITUDE, THE FOLLOWING APPROXIMATION IS USED. THE ASSUMPTIONS
R1650 ARE THE SAME AS THE GENERAL ROUTINE WITH THE ADDITION THAT SIGN AGREEMENT IS NECESSARY (B, C, d D POSITIVE).

R1652
$$\frac{C + SB}{C + SD} = \frac{(C + B - D)}{C} = 37777 + S(\frac{C + B - D}{C})$$

R1653
R1654

R1655 THE DIVISION MAY BE PERFORMED IMMEDIATELY SINCE B IS STRICTLY LESS THAN D AND C IS NOT LESS THAN .5.
1657 REP 506 LAST 1139 00,2842 4 0154 0 MAXDV CS MPAC SEE IF MAXDV CASE STILL HOLDS AFTER
1658 REP 61 LAST 1139 00,2843 8 0130 0 AD BUF NORMALIZATION.
1659 00,2844 0 0008 1 EXTEND
1660 00,2845 1 2847 1 BZF +2
1661 REP 2 LAST 1138 00,2846 1 2570 0 TCP GENDOV MPAC NOW LESS THAN BUF - DIVIDE AS USUAL
1662 REP 33 LAST 1134 00,2847 3 4872 0 +2 CAP POSMAX SET MAJOR PART OF RESULT.
1663 REP 507 LAST 1140 00,2850 54 154 0 TS MPAC
1664 REP 82 LAST 1140 00,2851 4 0131 0 CS BUF +1 FORM DIVIDEND OF MINOR PART OF RESULT.
1665 REP 508 LAST 1140 00,2852 6 0155 0 AD MPAC +1
1666 REP 2 LAST 1138 00,2853 1 2824 1 TCP ENDMAXDV GO ADD C AND DO DIVIDE, ATTACHING SIGN
A1667 BEFORE EXITING.



L INTERPRETER

USER=3 PAGE NO. 65 E3.83

P1668 VECTOR DIVIDED BY SCALAR, V/SC, IS EXECUTED HERE. THE VECTOR IS NOW IN MPAC WITH SCALAR IN BUF.

1670	REF	138	LAST 1132	00,2654	4 4712 0	V/SC2	CS	ONE	INITIALIZE DIVIDEND NORMALIZATION COUNT
1671	REF	4	LAST 1135	00,2655	54 137 0		TS	DVNORMCT	AND DIVISION SIGN REGISTER.
1672	REF	41	LAST 1118	00,2656	54 127 1		TS	VBUP +5	
1673	REF	1		00,2657	0 3010 0		TC	VEAGREE	FORCE SIGN AGREEMENT IN VECTOR
1674	REF	63	LAST 1140	00,2660	52 131 0		DXCH	BUF	
1675	REF	1		00,2661	0 7513 1		TC	ALSIGNAG	SIGN AGREE BUF
1676	REF	84	LAST 1141	00,2662	52 131 0		DXCH	BUF	
1677	REF	85	LAST 1141	00,2663	10 130 1		CCS	BUF	FORCE DIVISOR POSITIVE WITH MAJOR PART
1678	REF	1		00,2664	1 2721 0		TCF	/BUF+	NON-ZERO (IF POSSIBLE).
1679	REF	1		00,2665	1 2667 0		TCF	+2	
1680	REF	1		00,2666	1 2715 1		TCF	/BUF-	
1681	REF	86	LAST 1141	00,2667	56 131 1		XCH	BUF +1	SHIFT VECTOR AND SCALAR LEFT 14.
1682	REF	87	LAST 1141	00,2670	56 130 0		XCH	BUF	
1683	REF	509	LAST 1140	00,2671	56 155 0		XCH	MPAC +1	
1684	REF	510	LAST 1141	00,2672	56 154 1		XCH	MPAC	CHECK FOR OVERFLOW IN EACH CASE.
1685				00,2673	0 0006 1		EXTEND		
1686				00,2674	1 2676 0		BZF	+2	
1687	REF	3	LAST 1134	00,2675	1 2405 0		TCF	DVOVF	
1688	REF	511	LAST 1141	00,2676	56 160 0		XCH	MPAC +4	
1689	REF	512	LAST 1141	00,2677	56 157 1		XCH	MPAC +3	
1690				00,2700	0 0006 1		EXTEND		
1691				00,2701	1 2703 0		BZF	+2	
1692	REF	4	LAST 1141	00,2702	1 2405 0		TCF	DVOVF	
1693	REF	513	LAST 1141	00,2703	56 162 1		XCH	MPAC +6	
1694	REF	514	LAST 1141	00,2704	56 161 1		XCH	MPAC +5	
1695				00,2705	0 0006 1		EXTEND		
1696				00,2706	1 2710 1		BZF	+2	
1697	REF	5	LAST 1141	00,2707	1 2405 0		TCF	DVOVF	
1698	REF	88	LAST 1141	00,2710	10 130 1		CCS	BUF	
1699	REF	2	LAST 1141	00,2711	1 2721 0		TCF	/BUF+	
1700	REF	6	LAST 1141	00,2712	1 2405 0		TCF	DVOVF	ZERO DIVISOR - OVERFLOW.
1701	REF	2	LAST 1141	00,2713	1 2715 1		TCF	/BUF-	
1702	REF	7	LAST 1141	00,2714	1 2405 0		TCF	DVOVF	
1703				00,2715	0 0006 1	/BUF-	EXTEND		ON NEGATIVE, COMPLEMENT BUF AND MAINTAIN
1704	REF	89	LAST 1141	00,2716	4 0131 0		DCS	BUF	DVSIGN IN VBUP +5.
1705	REF	90	LAST 1141	00,2717	52 131 0		DXCH	BUF	
1706	REF	42	LAST 1141	00,2720	24 127 0		INCR	VBUP +5	



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 20211111-041

20'35 OCT. 28,1968 SATRAP .007 PAGE 1142

L INTERPRETER

USER'S PAGE NO. 66 E3 S3

1707			00,2721	0 0006 1	/BUF+	EXTEND	
1708	REP	91	LAST 1141	00,2722	3 0131 1	DCA	BUF
1709	REP	14	LAST 1134	00,2723	52 134 0	DXCH	BUF2
1710	REP	1		00,2724	1 2732 1	TCP	/NORM
1711			00,2725	0 0006 1	/NORM2	EXTEND	
1712	REP	5	LAST 1141	00,2726	24 137 1	AUG	DVNORMCT
1713			00,2727	0 0006 1		EXTEND	
1714	REP	92	LAST 1142	00,2730	3 0131 1	DCA	BUF
1715	REP	93	LAST 1142	00,2731	20 131 0	DAS	BUF
1716	REP	94	LAST 1142	00,2732	3 0130 0	CA	BUF
1717			00,2733	6 0000 1	DOUBLE		
1718			00,2734	54 000 0	OVSK		
1719	REP	1		00,2735	1 2725 1	TCP	/NORM2
1720	REP	1		00,2736	0 2750 1	TC	V/SCDV
1721	REP	515	LAST 1141	00,2737	52 160 1	DXCH	MPAC +3
1722	REP	516	LAST 1142	00,2740	52 155 1	DXCH	MPAC
1723	REP	517	LAST 1142	00,2741	52 160 1	DXCH	MPAC +3
1724	REP	2	LAST 1142	00,2742	0 2750 1	TC	V/SCDV
1725	REP	518	LAST 1142	00,2743	52 162 0	DXCH	MPAC +5
1726	REP	519	LAST 1142	00,2744	52 155 1	DXCH	MPAC
1727	REP	520	LAST 1142	00,2745	52 162 0	DXCH	MPAC +5
1728	REP	3	LAST 1142	00,2746	0 2750 1	TC	V/SCDV
1729	REP	2	LAST 1125	00,2747	1 7367 0	TCP	VROTATEX

LEAVE ABS(ORIG DIVISOR) IN BUF2
FOR OVERFLOW TESTING
NORMALIZE DIVISOR IN BUF.

IF LESS THAN .5, AUGMENT DVNORMCT AND
DOUBLE DIVISOR.

SEE IF DIVISOR NORMALIZED.

DOUBLE AND TRY AGAIN IF NOT.

DO X COMPONENT DIVIDE.
SUPPLY ARGUMENTS IN USUAL SEQUENCE.

Y COMPONENT.

Z COMPONENT.
GO RE-ARRANGE COMPONENTS BEFORE EXIT.



L INTERPRETER

USER-S PAGE NO. 67

E3 53

P1730 SUBROUTINE USED BY V/SC TO DIVIDE VECTOR COMPONENT IN MPAC,+1 BY THE SCALAR GIVEN IN BUF.

1732	REP	43	LAST	1141	00,2750	3 0127 0	V/SCDV	CA	VBUP +5	REFLECTS SIGN OF SCALAR.
1733	REP	7	LAST	1139	00,2751	54 136 1		TS	DV SIGN	
1734	REP	521	LAST	1142	00,2752	10 154 0		CCS	MPAC	FORCE MPAC POSITIVE, EXITING ON ZERO.
1735	REP	1			00,2753	1 2767 1		TCP	/MPAC+	
1736					00,2754	1 2756 0		TCP	+2	
1737	REP	1			00,2755	1 2763 0		TCP	/MPAC-	
1738	REP	522	LAST	1143	00,2756	10 155 1		CCS	MPAC +1	
1739	REP	2	LAST	1143	00,2757	1 2767 1		TCP	/MPAC+	
1740	REP	263	LAST	1139	00,2760	0 0002 0		TC	0	
1741	REP	2	LAST	1143	00,2761	1 2763 0		TCP	/MPAC-	
1742	REP	264	LAST	1143	00,2762	0 0002 0		TC	0	
1743					00,2763	0 0006 1	/MPAC-	EXTEND		USUAL COMPLEMENTING AND SETTING OF SIGN.
1744	REP	523	LAST	1143	00,2764	4 0155 1		DCS	MPAC	
1745	REP	524	LAST	1143	00,2765	52 155 1		DXCH	MPAC	
1746	REP	8	LAST	1143	00,2766	24 136 0		INCR	DV SIGN	
1747	REP	139	LAST	1141	00,2767	4 4712 0	/MPAC+	CS	ONE	INITIALIZE NEAR-ONE SWITCH.
1748	REP	4	LAST	1136	00,2770	54 140 0		TS	MAXDVSW	
1749	REP	525	LAST	1143	00,2771	4 0154 0		CS	MPAC	CHECK POSSIBLE OVERFLOW.
1750	REP	15	LAST	1142	00,2772	6 0133 0		AD	BUF2	UNNORMALIZED INPUT DIVISOR.
1751	REP	308	LAST	1135	00,2773	10 000 0		CCS	A	
1752	REP	1			00,2774	1 3004 1		TCP	DDV CALL	NOT NEAR-ONE
1753					00,2775	1 2777 0		TCP	+2	+0 IS JUST POSSIBLE
1754	REP	8	LAST	1141	00,2776	1 2405 0		TCP	DVO/P	NO HOPE
1755	REP	5	LAST	1143	00,2777	54 140 0		TS	MAXDVSW	SIGNAL POSSIBLE NEAR-ONE CASE
1756	REP	526	LAST	1143	00,3000	4 0155 1		CS	MPAC +1	SEE IF DIVISION CAN BE DONE
1757	REP	16	LAST	1143	00,3001	6 0134 1		AD	BUF2 +1	
1758					00,3002	0 0006 1		EXTEND		
1759	REP	9	LAST	1143	00,3003	6 2405 1		BZMP	DVO/P	
1760	REP	527	LAST	1143	00,3004	52 155 1	DDV CALL	DXCH	MPAC	CALL PRE-DIVIDE NORMALIZATION.
1761	REP	6	LAST	1142	00,3005	50 137 1		INDEX	DVNORMCT	
1762	REP	2	LAST	1135	00,3006	1 2565 1		TCP	MAXTEST	



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28,1968 SATRAP .007 PAGE 1144

L INTERPRETER

USER=3 PAGE NO. 66 E3 53

1763			00,3007	32506 0	SLOPELO DEC	.6324	
1764	REF 265	LAST 1143	00,3010	56 002 0	VECAGREE XCH	Q	
1765	REF 528	LAST 1143	00,3011	52 155 1	DXCH MPAC		
1766	REF 2	LAST 1141	00,3012	0 7513 1	TC ALSIGNAG		
1767	REF 529	LAST 1144	00,3013	52 155 1	DXCH MPAC		
1768	REF 530	LAST 1144	00,3014	52 160 1	DXCH MPAC +3		
1769	REF 3	LAST 1144	00,3015	0 7513 1	TC ALSIGNAG		
1770	REF 531	LAST 1144	00,3016	52 160 1	DXCH MPAC +3		
1771	REF 532	LAST 1144	00,3017	52 162 0	DXCH MPAC +5		
1772	REF 4	LAST 1144	00,3020	0 7513 1	TC ALSIGNAG		
1773	REF 533	LAST 1144	00,3021	52 162 0	DXCH MPAC +5		
1774	REF 309	LAST 1143	00,3022	0 0000 1	TC A		

SAVE Q IN A

SIGNAGREE MPAC

SIGN AGREE MPAC +3

SIGNAGREE MPAC +5



L INTERPRETER

USER-S PAGE NO. 69 E3 S3

P1775

THE FOLLOWING ROUTINE EXECUTES THE UNIT INSTRUCTION, WHICH TAKES THE UNIT OF THE VECTOR IN MPAC.

1777	REF	2	LAST 1141	00,3023	0 3010 0	UNIT	TC	VEGAGREE	
1778	REF	2	LAST 1114	00,3024	0 7501 1		TC	MPACVBUF	FORCE SIGN AGREEMENT IN VECTOR
1779	REF	229	LAST 1139	00,3025	3 4714 1		CAP	ZERO	SAVE ARGUMENT IN VBUF
1780	REF	6	LAST 1132	00,3026	56 121 0		XCH	OVFPND	MUST SENSE OVERFLOW IN FOLLOWING DOT.
1781	REF	3	LAST 68	00,3027	54 141 1		TS	TEM1	
1782	REF	1		00,3030	0 3317 1		TC	VQSUSB	
1783	REF	4	LAST 1145	00,3031	3 0141 0		CA	TEM1	DOT MPAC WITH ITSELF.
1784	REF	7	LAST 1145	00,3032	56 121 0		XCH	OVFPND	
1785				00,3033	0 0006 1		EXTEND		
1786				00,3034	1 3036 0		BZF	+2	
1787	REF	10	LAST 1143	00,3035	1 2405 0		TCF	DVOVF	
1788				00,3036	0 0006 1		EXTEND		
1789	REF	534	LAST 1144	00,3037	3 0155 0		DCA	MPAC	LEAVE THE SQUARE OF THE LENGTH OF THE
1790	REF	26	LAST 1099	00,3040	50 120 1		INDEX	FIXLOC	ARGUMENT IN LVSQUARE.
1791	REF	1		00,3041	52 043 1		DCH	LVSQUARE	
1792	REF	1		00,3042	0 3343 0		TC	SQRTSUB	DO TAKE THE NORMALIZED SQUARE ROOT.
1793	REF	535	LAST 1145	00,3043	10 154 0		CCS	MPAC	CHECK FOR UNIT OVERFLOW.
1794				00,3044	1 3051 1		TCF	+5	MPAC IS NOT LESS THAN .5 UNLESS
1795	REF	189	LAST 1136	00,3045	54 001 1		TS	L	
1796	REF	27	LAST 1145	00,3046	50 120 1		INDEX	FIXLOC	
1797	REF	1		00,3047	52 045 1		DCH	LV	
1798	REF	11	LAST 1145	00,3050	1 2405 0		TCF	DVOVF	INPUT TO SQRTSUB WAS 0.
1799	REF	1		00,3051	4 4333 1		CS	FOURTEEN	SEE IF THE INPUT WAS SO SMALL THE THE
1800	REF	46	LAST 1131	00,3052	6 0135 0		AD	MPTMP	FIRST TWO REGISTERS OF THE SQUARE WERE 0
1801	REF	310	LAST 1144	00,3053	10 000 0		CCS	A	
1802				00,3054	4 0000 0		COM		IF SO, SAVE THE NEGATIVE OF THE SHIFT
1803	REF	1		00,3055	1 3133 1		TCF	SMALL	COUNT -15D.
1804	REF	1		00,3056	1 3065 0		TCF	LARGE	(THIS IS USUALLY THE CASE.)
1805	REF	4	LAST 1061	00,3057	4 4720 1		CS	THIRTEEN	IF THE SHIFT COUNT WAS EXACTLY 14, SET
1806	REF	47	LAST 1145	00,3060	54 135 1		TS	MPTMP	THE PRE-DIVIDE NORM COUNT TO -13D.
1807	REF	536	LAST 1145	00,3061	3 0154 1		CA	MPAC	SHIFT THE LENGTH RIGHT 14 BEFORE STORING
1808	REF	190	LAST 1145	00,3062	54 001 1	SMALL2	TS	L	(SMALL EXITS TO THIS POINT).
1809	REF	230	LAST 1145	00,3063	3 4714 1		CAP	ZERO	
1810	REF	1		00,3064	1 3112 1		TCF	LARGE2	GO TO STORE LENGTH AND PROCEED.
1811	REF	48	LAST 1145	00,3065	10 135 1	LARGE	CCS	MPTMP	MOST ALL CASES COME HERE.
1812	REF	1		00,3066	1 3074 0		TCF	LARGE3	SEE IF NO NORMALIZATION WAS REQUIRED BY
1813	REF	1		00,3067	4 2024 1		CS	SDDV	SORT, AND IF SO, SET UP FOR A SHIFT
1814	REF	49	LAST 1145	00,3070	54 135 1		TS	MPTMP	RIGHT 1 BEFORE DIVIDING TO PRODUCE
1815				00,3071	0 0006 1		EXTEND		THE DESIRED HALF UNIT VECTOR.
1816	REF	537	LAST 1145	00,3072	3 0155 0		DCA	MPAC	



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1146

L INTERPRETER

USER-S PAGE NO. 70 E3 53

1817 REF 2 LAST 1145 00,3073 1 3112 1

TCP LARGE2



L INTERPRETER

USER=3 PAGE NO. 71 E3 S3

1818				00,3074	4 0000 0	LARGE3	COM			
1819	REP	50	LAST 1145	00,3075	54 135 1		TS	MPTEMP		LEAVE NEGATIVE OF SHIFT COUNT-1 FOR PREDIVIDE LEFT SHIFT.
1820				00,3076	4 0000 0		COM			
1821	REP	311	LAST 1145	00,3077	50 000 1		INDEX	A		PICK UP REQUIRED SHIFTING BIT TO UNNORM- ALIZE THE SORT RESULT.
1822	REP	66	LAST 1130	00,3100	3 4675 1		CAP	BIT14		
1823	REP	95	LAST 1142	00,3101	54 130 1		TS	BUP		
1824				00,3102	0 0008 1		EXTEND			
1825	REP	538	LAST 1145	00,3103	7 0155 1		MP	MPAC +1		
1826	REP	96	LAST 1147	00,3104	58 130 0		XCH	BUP		
1827				00,3105	0 0008 1		EXTEND			(UNNORMALIZE THE SORT FOR LV).
1828	REP	539	LAST 1147	00,3106	7 0154 0		MP	MPAC		
1829	REP	191	LAST 1145	00,3107	56 001 0		XCH	L		
1830	REP	97	LAST 1147	00,3110	6 0130 0		AD	BUP		
1831	REP	192	LAST 1147	00,3111	58 001 0		XCH	L		
1832	REP	28	LAST 1145	00,3112	50 120 1	LARGE2	INDEX	PIXLOC		
1833	REP	2	LAST 1145	00,3113	52 045 1		DXCH	LV		LENGTH NOW STORED IN WORK AREA.
1834	REP	140	LAST 1143	00,3114	4 4712 0		CS	ONE		
1835	REP	6	LAST 1143	00,3115	54 140 0		TS	MAXOVSW		NO MAXOV CASES IN UNIT.
1836	REP	44	LAST 1143	00,3116	52 123 0		DXCH	VBUP		
1837	REP	540	LAST 1147	00,3117	52 155 1		DXCH	MPAC		PREPARE X COMPONENT FOR DIVIDE, SETTING LENGTH OF VECTOR AS DIVISOR IN BUP.
1838	REP	98	LAST 1147	00,3120	52 131 0		DXCH	BUP		
1839	REP	1		00,3121	0 3151 1		TC	UNITDV		
1840	REP	45	LAST 1147	00,3122	52 125 0		DXCH	VBUP +2		DO Y AND Z IN USUAL FASHION SO WE CAN EXIT THROUGH VROTATEX.
1841	REP	541	LAST 1147	00,3123	52 155 1		DXCH	MPAC		
1842	REP	542	LAST 1147	00,3124	52 160 1		DXCH	MPAC +3		
1843	REP	2	LAST 1147	00,3125	0 3151 1		TC	UNITDV		
1844	REP	46	LAST 1147	00,3126	52 127 1		DXCH	VBUP +4		
1845	REP	543	LAST 1147	00,3127	52 155 1		DXCH	MPAC		
1846	REP	544	LAST 1147	00,3130	52 162 0		DXCH	MPAC +5		
1847	REP	3	LAST 1147	00,3131	0 3151 1		TC	UNITDV		
1848	REP	3	LAST 1142	00,3132	1 7367 0		TCF	VROTATEX		AND EXIT.



L INTERPRETER

USER'S PAGE NO. 72 E3 83

P1849 IF THE LENGTH OF THE ARGUMENT VECTOR WAS LESS THAN 2(-28), EACH COMPONENT MUST BE SHIFTED LEFT AT LEAST
 R1851 14 PLACES BEFORE THE DIVIDE. NOTE THAT IN THIS CASE, THE MAJOR PART OF EACH COMPONENT IS ZERO.

1853	REP	51	LAST	1147	00,3133	54 135 1	SMALL	TS	MPTMP	NEGATIVE OF PRE-DIVIDE SHIFT COUNT.
1854	REP	231	LAST	1145	00,3134	3 4714 1		CAP	ZERO	SHIFT EACH COMPONENT LEFT 14.
1855	REP	47	LAST	1147	00,3135	56 123 1		XCH	VBUP +1	
1856	REP	48	LAST	1148	00,3138	56 122 0		XCH	VBUP	
1857	REP	49	LAST	1148	00,3137	58 125 1		XCH	VBUP +3	
1858	REP	50	LAST	1148	00,3140	58 124 0		XCH	VBUP +2	
1859	REP	51	LAST	1148	00,3141	58 127 0		XCH	VBUP +5	
1860	REP	52	LAST	1148	00,3142	56 126 1		XCH	VBUP +4	
1861	REP	52	LAST	1148	00,3143	4 0135 1		CS	MPTMP	
1862	REP	312	LAST	1147	00,3144	50 000 1		INDEX	A	
1863	REP	67	LAST	1147	00,3145	3 4875 1		CAP	BIT14	
1864					00,3146	0 0008 1		EXTEND		
1865	REP	545	LAST	1147	00,3147	7 0154 0		MP	MPAC	
1866	REP	1			00,3150	1 3062 1		TCP	SMALL2	
1867	REP	4	LAST	724	4720			THIRTEEN =	OCT15	
1868	REP	2	LAST	736	4333			FOURTEEN =	OCT18	
1869	REP	14	LAST	369	4333			OCT18 =	R1D1	

L INTERPRETER

USER'S PAGE NO. 73 E3 S3

P1870

THE FOLLOWING ROUTINE SETS UP THE CALL TO THE DIVIDE ROUTINES.

1871	REF 546	LAST 1148	00,3151	10 154 0	UNITOV	CCS	MPAC	FORCE MPAC POSITIVE IF POSSIBLE, SETTING
1872	REF 1		00,3152	1 3170 0	TCP	UMPAC+		DVSIGN ACCORDING TO THE SIGN OF MPAC
1873			00,3153	1 3155 1	TCP	+2		SINCE THE DIVISOR IS ALWAYS POSITIVE
1874	REF 1		00,3154	1 3162 0	TCP	UMPAC-		HERE.
1875	REF 547	LAST 1149	00,3155	10 155 1		CCS	MPAC +1	
1876	REF 2	LAST 1149	00,3156	1 3170 0	TCP	UMPAC+		
1877	REF 266	LAST 1144	00,3157	0 0002 0	TC	0		EXIT IMMEDIATELY ON ZERO.
1878	REF 2	LAST 1149	00,3160	1 3162 0	TCP	UMPAC-		
1879	REF 267	LAST 1149	00,3161	0 0002 0	TC	0		
1880	REF 232	LAST 1148	00,3162	4 4714 0	UMPAC-	CS	ZERO	IF NEGATIVE, SET -0 IN DVSIGN FOR FINAL
1881	REF 9	LAST 1143	00,3163	54 136 1		TS	DVSIGN	COMPLEMENT.
1882			00,3164	0 0008 1		EXTEND		
1883	REF 548	LAST 1149	00,3165	4 0155 1		DCS	MPAC	PICK UP ABSOLUTE VALUE OF ARG AND JUMP.
1884	REF 53	LAST 1148	00,3166	50 135 0		INDEX	MPTEMP	
1885	REF 3	LAST 1143	00,3167	1 2564 0		TCP	MAXTEST -1	
1886	REF 10	LAST 1149	00,3170	54 136 1	UMPAC+	TS	DVSIGN	SET DVSIGN FOR POSITIVE QUOTIENT.
1887	REF 549	LAST 1149	00,3171	52 155 1		DXCH	MPAC	
1888	REF 54	LAST 1149	00,3172	50 135 0		INDEX	MPTEMP	
1889	REF 4	LAST 1149	00,3173	1 2564 0		TCP	MAXTEST -1	



L INTERPRETER

USER=8 PAGE NO. 74 E3 S3

P1890 MISCELLANEOUS UNARY OPERATIONS.

1891	REF	1		00,3174	0 3300 1	DSQ	TC	DSQSUB	SQUARE THE DP CONTENTS OF MPAC.
1892	REF	41	LAST 1135	00,3175	1 8030 0		TCP	DANZIG	
1893	REF	22	LAST 1131	00,3176	10 183 1	ABVALABS	CCS	MODE	ABVAL OR ABS INSTRUCTION.
1894	REF	1		00,3177	1 3228 0		TCP	ABS	DO ABS ON SCALAR.
1895	REF	2	LAST 1150	00,3200	1 3228 0		TCP	ABS	
1898	REF	2	LAST 1145	00,3201	0 3317 1	ABVAL	TC	VSQSUB	DOT MPAC WITH ITSELF.
1897	REF	23	LAST 1150	00,3202	22 183 0		LXCH	MODE	MODE IS NOW DP (L ZERO AFTER DAS).
1898				00,3203	0 0008 1		EXTEND		STORE SQUARE OF LENGTH IN WORK AREA.
1899	REF	550	LAST 1149	00,3204	3 0155 0		DCA	MPAC	
1900	REF	29	LAST 1147	00,3205	50 120 1		INDEX	FIXLOC	
1901	REF	2	LAST 1145	00,3206	52 043 1		DXCH	LVSQUARE	

L INTERPRETER

USER=5 PAGE NO. 75 E3 S3

P1902 PROGRAM DESCRIPTION- SUBROUTINE SORT

R1903 FUNCTIONAL DESCRIPTION-DOUBLE PRECISION SQUARE ROOT ROUTINE

R1904 THIS PROGRAM TAKES THE SQUARE ROOT OF THE 27 OR 28 MOST SIGNIFICANT BITS IN THE TRIPLE PRECISION SET OF
R1906 NUMBERS-MPAC,MPAC+1,AND MPAC+2. THE ROOT IS RETURNED DOUBLE PRECISION IN MPAC AND MPAC+1.

R1908 WARNING- THIS SUBROUTINE USES A TRIPLE PRECISION INPUT. THE PROGRAMMER MUST ASSURE THE CONTENTS OF MPAC+2

R1910 ESPECIALLY IF THE CONTENTS OF MPAC IS SMALL OR ZERO. FOR DETAILS SEE STG MEMO NO.949.

R1912 CALLING SEQUENCE- IN INTERPRETIVE MODE I.E., FOLLOWING TC INTREST,SORT NO ADDRESS IS ALLOWED

R1914 INPUT SCALING THE BINARY POINT IS ASSUMED TO THE RIGHT OF BIT 15. THE ANSWER IS RETURNED WITH THE SAME SCALING

R1916 SUBROUTINES- GENSOR,MPACSHR, SORTSUB,ABORT

R1917 ABORT EXIT MODE- ABORTS ON NEGATIVE INPUT -1.2X10E-4 (77775 OCTAL)

OR LESS.

R1919 DISPLAYS ERROR CODE 1302

R1920 TC ABORT

R1921 OCT 1302

R1922 DEBRIS - LOCATIONS BUF,MPTMP,ADDRWD ARE USED

1923	REF	2	LAST	1145	00,3207	0 3343 0	SORT	TC	SORTSUB	TAKE THE SQUARE ROOT OF MPAC.
1924	REF	55	LAST	1149	00,3210	10 135 1		CCS	MPTMP	RETURNED NORMALIZED SQUARE ROOT. SEE IF
1925					00,3211	1 3213 0		TCF	+2	ANY UN-NORMALIZATION REQUIRED AND EXIT
1926	REF	42	LAST	1150	00,3212	1 6030 0		TCF	DANZIG	IF NOT.
1927	REF	3	LAST	1130	00,3213	6 3730 0		AD	NEG12	A RIGHT SHIFT OF MORE THAN 13 COULD BE
1928					00,3214	0 0006 1		EXTEND		REQUIRED IF INPUT WAS ZERO IN MPAC,+1.
1929	REF	1			00,3215	6 3221 0		BZMP	SORTSHPT	GOES HERE IN MOST CASES.
1930					00,3216	22 007 0		ZL		IF A LONG SHIFT IS REQUIRED, GO TO
1931	REF	77	LAST	1131	00,3217	22 116 1		LXCH	ADDRWD	GENERAL RIGHT SHIFT ROUTINES.
1932	REF	4	LAST	1130	00,3220	1 2303 1		TCF	GENSOR +4	ADDRWD WAS ZERO TO PREVENT ROUND.
1933	REF	56	LAST	1151	00,3221	50 135 0	SORTSHPT INDEX	MPTMP		SELECT SHIFTING BIT AND EXIT THROUGH
1934	REF	45	LAST	1101	00,3222	3 4674 0	CAP	BIT15		SHIFT ROUTINES.
1935	REF	57	LAST	1151	00,3223	54 135 1	TS	MPTMP		
1936	REF	233	LAST	1149	00,3224	3 4714 1	CAP	ZERO		TO ZERO MPAC +2 IN THE PROCESS.
1937	REF	2	LAST	1130	00,3225	1 2036 1	TCF	MPACSHR +3		
1938	REF	3	LAST	1127	00,3226	0 6672 1	ABS	TC	BRANCH	TEST SIGN OF MPAC AND COMPLEMENT IF
1939	REF	43	LAST	1151	00,3227	1 6030 0		TCF	DANZIG	
1940	REF	44	LAST	1151	00,3230	1 6030 0		TCF	DANZIG	
1941	REF	4	LAST	1121	00,3231	1 7637 0		TCF	COMP	



L INTERPRETER

USER'S PAGE NO. 76 E3 S3

1942	REP	16	LAST	1116	00,3232	4 4710 1	VDEF	CS	PCUR
1943	REP	13	LAST	1119	00,3233	26 166 1		ADS	PUSHLOC
1944					00,3234	0 0006 1		EXTEND	
1945	REP	313	LAST	1148	00,3235	5 0000 1		INDEX	A
1946					00,3236	3 0003 1		DCA	2
1947	REP	551	LAST	1150	00,3237	52 160 1		DYCH	MPAC +3
1948					00,3240	0 0006 1		EXTEND	
1949	REP	14	LAST	1152	00,3241	5 0166 0		INDEX	PUSHLOC
1950					00,3242	3 0001 0		DCA	0
1951	REP	552	LAST	1152	00,3243	52 162 0		DYCH	MPAC +5
1952	REP	2	LAST	1118	00,3244	1 6470 0		TCP	VMODE
1953	REP	3	LAST	1150	00,3245	0 3317 1	VSQ	TC	VSSUB
1954	REP	1			00,3246	1 7301 0		TCP	DMODE
1955					00,3247	0 0006 1	PUSH	EXTEND	
1956	REP	553	LAST	1152	00,3250	3 0155 0		DCA	MPAC
1957	REP	15	LAST	1152	00,3251	50 166 0		INDEX	PUSHLOC
1958					00,3252	52 001 1		DYCH	0
1959	REP	24	LAST	1150	00,3253	50 163 0		INDEX	MODE
1960	REP	5	LAST	1096	00,3254	3 6213 1		CAP	NO.WDS
1961	REP	16	LAST	1152	00,3255	26 166 1		ADS	PUSHLOC
1962	REP	25	LAST	1152	00,3256	10 163 1		CCS	MODE
1963	REP	1			00,3257	1 3272 1		TCP	TPUSH
1964	REP	45	LAST	1151	00,3260	1 6030 0		TCP	DANZIG
1965					00,3261	0 0006 1		EXTEND	
1966	REP	554	LAST	1152	00,3262	3 0160 0		DCA	MPAC +3
1967	REP	17	LAST	1152	00,3263	50 166 0		INDEX	PUSHLOC
1968					00,3264	51=775 0		DYCH	0 -4
1969					00,3265	0 0006 1		EXTEND	
1970	REP	555	LAST	1152	00,3266	3 0162 1		DCA	MPAC +5
1971	REP	16	LAST	1152	00,3267	50 166 0		INDEX	PUSHLOC
1972					00,3270	51=777 1		DYCH	0 -2
1973	REP	46	LAST	1152	00,3271	1 6030 0		TCP	DANZIG
1974	REP	556	LAST	1152	00,3272	3 0156 0	TPUSH	CA	MPAC +2
1975	REP	2	LAST	1095	00,3273	1 6523 1		TCP	ENDTPUSH +2
1976	REP	30	LAST	1150	00,3274	50 120 1	RVO	INDEX	FIXLOC
1977	REP	18	LAST	1098	00,3275	3 0052 0		CA	OPRET
1978	REP	21	LAST	1110	00,3276	54 117 1		TS	POLISH
1979	REP	5	LAST	1099	00,3277	1 6621 0		TCP	GOTO +4

VECTOR DEFINE - ESSENTIALLY TREATS
SCALAR IN MPAC AS X COMPONENT, PUSHES UP
FOR Y AND THEN AGAIN FOR Z.

MODE IS NON VECTOR.

DOT MPAC WITH ITSELF.
MODE IS NOW DP.

PUSH DOWN MPAC LEAVING IT LOADED.

PUSH DOWN FIRST TWO REGISTERS IN EACH

INCREMENT PUSHDOWN POINTER.

PUSH DOWN MPAC +2.
DONE FOR DP.

ON VECTOR, PUSH DOWN Y AND Z COMPONENTS.

RVO - RETURN IVA OPRET.

(ASSUME OPRET POINTS TO FIXED ONLY.)



L INTERPRETER

USRA-S PAGE NO. 77 E3 S3

P1980 THE FOLLOWING SUBROUTINES ARE USED IN SQUARING MPAC, IN BOTH THE SCALAR AND VECTOR SENSE. THEY ARE
R1982 SPECIAL CASES OF DMPSUB AND DOTSUB, PUT IN TO SAVE SOME TIME.

1983	REP 557	LAST 1152	00,3300	3 0155 0	DSQSUB	CA	MPAC +1	SQUARES THE SCALAR CONTENTS OF MPAC.
1984			00,3301	0 0008 1		EXTEND		
1985			00,3302	7 0000 0		SQUARE		
1986	REP 556	LAST 1153	00,3303	54 156 1		TS	MPAC +2	
1987	REP 234	LAST 1151	00,3304	3 4714 1		CAP	ZERO	FORM 2(CROSS TERM).
1988	REP 559	LAST 1153	00,3305	58 155 0		XCH	MPAC +1	
1989			00,3308	0 0008 1		EXTEND		
1990	REP 580	LAST 1153	00,3307	7 0154 0		MP	MPAC	
1991			00,3310	20 001 1		DDOUBL		AND MAYBE OVERFLOW.
1992	REP 561	LAST 1153	00,3311	20 158 1		DAS	MPAC +1	AND SET A TO NET OVERFLOW.
1993	REP 562	LAST 1153	00,3312	58 154 1		XCH	MPAC	
1994			00,3313	0 0008 1		EXTEND		
1995			00,3314	7 0000 0		SQUARE		
1996	REP 583	LAST 1153	00,3315	20 155 1		DAS	MPAC	
1997	REP 268	LAST 1149	00,3318	0 0002 0		TC	0	
1998			00,3317	0 0006 1	VSOSUB	EXTEND		DOTS THE VECTOR IN MPAC WITH ITSELF.
1999	REP 8	LAST 1108	00,3320	22 137 1		QXCH	DOTRET	
2000	REP 2	LAST 1150	00,3321	0 3300 1		TC	DSQSUB	SQUARE THE X COMPONENT.
2001	REP 564	LAST 1153	00,3322	52 160 1		DXCH	MPAC +3	
2002	REP 565	LAST 1153	00,3323	52 155 1		DXCH	MPAC	
2003	REP 99	LAST 1147	00,3324	52 131 0		DXCH	BUF	SO WE CAN END IN DOTSUB.
2004	REP 566	LAST 1153	00,3325	3 0156 0		CA	MPAC +2	
2005	REP 100	LAST 1153	00,3326	54 132 0		TS	BUF +2	
2006	REP 3	LAST 1153	00,3327	0 3300 1		TC	DSQSUB	SQUARE Y COMPONENT.
2007	REP 567	LAST 1153	00,3330	52 156 1		DXCH	MPAC +1	
2008	REP 101	LAST 1153	00,3331	20 132 0		DAS	BUF +1	
2009	REP 568	LAST 1153	00,3332	8 0154 1		AD	MPAC	
2010	REP 102	LAST 1153	00,3333	6 0130 0		AD	BUF	
2011	REP 103	LAST 1153	00,3334	54 130 1		TS	BUF	
2012			00,3335	1 3337 1		TCF	+2	
2013	REP 6	LAST 1145	00,3338	54 121 1		TS	OVFIND	IF OVERFLOW.
2014	REP 589	LAST 1153	00,3337	52 162 0		DXCH	MPAC +5	
2015	REP 570	LAST 1153	00,3340	52 155 1		DXCH	MPAC	
2016	REP 4	LAST 1153	00,3341	0 3300 1		TC	DSQSUB	SQUARE Z COMPONENT.
2017	REP 1		00,3342	1 7154 1		TCF	ENDDOT	END AS IN DOTSUB.



L INTERPRETER

USER=5 PAGE NO. 78 E3 S3

P2018 DOUBLE PRECISION SQUARE ROOT ROUTINE. TAKE THE SQUARE ROOT OF THE TRIPLE PRECISION (MPAC +2 USED ONLY
R2020 IN NORMALIZATION) CONTENTS OF MPAC AND LEAVE THE NORMALIZED RESULT IN MPAC (C(MPAC) GREATER THAN OR EQUAL TO
R2022 .5). THE RIGHT SHIFT COUNT (TO UNNORMALIZE) IS LEFT IN MPTMP.

2023	REP	235	LAST	1153	00,3343	3 4714 1	SORTSUB	CAP	ZERO	START BY ZEROING RIGHT SHIFT COUNT.
2024	REP	58	LAST	1151	00,3344	54 135 1	TS	MPTMP		
2025	REP	571	LAST	1153	00,3345	10 154 0	CCS	MPAC		
2026	REP	1			00,3346	1 3404 0	TCP	SMPAC+		CHECK FOR POSITIVE ARGUMENT, SHIFTING
2027					00,3347	1 3351 1	TCP	+2		FIRST SIGNIFICANT MPAC REGISTER INTO
2028	REP	1			00,3350	1 3373 1	TCP	SORTNEG		MPAC ITSELF.
										SEE IF MAG OF ARGUMENT LESS THAN 10(-4).
2029	REP	572	LAST	1154	00,3351	56 156 0	XCH	MPAC +2		
2030	REP	573	LAST	1154	00,3352	56 155 0	XCH	MPAC +1		MPAC IS ZERO - SHIFT LEFT 14.
2031	REP	574	LAST	1154	00,3353	54 154 0	TS	MPAC		
2032	REP	15	LAST	905	00,3354	3 4716 0	CAP	SEVEN		AUGMENT RIGHT SHIFT COUNTER.
2033	REP	59	LAST	1154	00,3355	54 135 1	TS	MPTMP		
2034	REP	575	LAST	1154	00,3356	10 154 0	CCS	MPAC		SEE IF MPAC NOW PNZ.
2035	REP	2	LAST	1154	00,3357	1 3404 0	TCP	SMPAC+		
2036					00,3360	1 3362 1	TCP	+2		
2037	REP	1			00,3361	1 3376 1	TCP	ZEROANS		NEGATIVE BUT LESS THAN 10(-4) IN MAG.
2038	REP	576	LAST	1154	00,3362	56 155 0	XCH	MPAC +1		
2039	REP	577	LAST	1154	00,3363	54 154 0	TS	MPAC		ZERO - SHIFT LEFT 14 AGAIN.
2040	REP	16	LAST	1154	00,3364	3 4716 0	CAP	SEVEN		AUGMENT RIGHT SHIFT COUNTER.
2041	REP	60	LAST	1154	00,3365	26 135 1	ADS	MPTMP		
2042	REP	578	LAST	1154	00,3366	10 154 0	CCS	MPAC		
2043	REP	3	LAST	1154	00,3367	1 3404 0	TCP	SMPAC+		
2044	REP	269	LAST	1153	00,3370	0 0002 0	TC	0		SORT(0) = 0.
2045	REP	2	LAST	1154	00,3371	1 3376 1	TCP	ZEROANS		
2046	REP	1			00,3372	1 3452 0	TCP	FIXROOT		DO NOT LEAVE SORTSUB WITH -0 IN MPAC.
2047	REP	314	LAST	1152	00,3373	10 000 0	SORTNEG	CCS	A	ARGUMENT IS NEGATIVE, BUT SEE IF SIGN-
2048	REP	1			00,3374	1 3402 0	TCP	SORTABRT		CORRECTED ARGUMENT IS LESS THAN 10(-4)
2049	REP	579	LAST	1154	00,3375	10 155 1	CCS	MPAC +1		IN MAGNITUDE. IF SO, CALL ANSWER ZERO.
2050	REP	238	LAST	1154	00,3376	3 4714 1	ZEROANS	CAP	ZERO	FORCE ANSWER TO ZERO HERE.
2051	REP	2	LAST	1154	00,3377	1 3452 0	TCP	FIXROOT		
2052	REP	2	LAST	1154	00,3400	1 3402 0	TCP	SORTABRT		
2053	REP	3	LAST	1154	00,3401	1 3452 0	TCP	FIXROOT		
2054	REP	3	LAST	367	00,3402	0 5622 1	SORTABRT	TC	POODOO	
2055					00,3403	01302 1	OCT		1302	

L INTERPRETER

USER'S PAGE NO. 79 E3 S3

2056	REF	1	00,3404	8 2444 1	MPAC+	AD	-1/2+2
2057			00,3405	0 0008 1		EXTEND	
2058	REF	1	00,3406	8 3455 0		BZAP	SRTST
2059	REF	580	LAST	1154	00,3407	52 155 1	DXCH MPAC
2060	REF	25	LAST	1138	00,3410	22 021 1	LXCH SR
2061					00,3411	0 0008 1	EXTEND
2062	REF	18	LAST	1138	00,3412	7 4875 0	MP HALF
2063	REF	581	LAST	1155	00,3413	52 155 1	DXCH MPAC
2064	REF	26	LAST	1155	00,3414	58 021 1	XCH SR
2065	REF	582	LAST	1155	00,3415	26 155 1	ADS MPAC +1
2066	REF	1			00,3416	3 2314 0	ARCHI CAP SLOPHI
2067					00,3417	0 0008 1	EXTEND
2068	REF	583	LAST	1155	00,3420	7 0154 0	MP MPAC
2069	REF	1			00,3421	8 2588 0	AD BIASHI
2070	REF	104	LAST	1153	00,3422	54 130 1	+4 TS BUP
2071	REF	584	LAST	1155	00,3423	3 0154 1	CA MPAC
2072					00,3424	22 007 0	ZL
2073					00,3425	0 0008 1	EXTEND
2074	REF	105	LAST	1155	00,3426	10 130 1	DV BUP
2075					00,3427	0 0008 1	EXTEND
2076	REF	17	LAST	1155	00,3430	7 4875 0	MP HALF
2077	REF	108	LAST	1155	00,3431	28 130 1	ADS BUP
2078					00,3432	0 0008 1	EXTEND
2079	REF	18	LAST	1155	00,3433	7 4875 0	MP HALF
2080	REF	585	LAST	1155	00,3434	52 155 1	DXCH MPAC
2081					00,3435	0 0008 1	EXTEND
2082	REF	107	LAST	1155	00,3436	10 130 1	DV BUP
2083	REF	108	LAST	1155	00,3437	54 131 0	TS BUP +1
2084	REF	237	LAST	1154	00,3440	3 4714 1	CAP ZERO
2085	REF	193	LAST	1147	00,3441	56 001 0	XCH L
2086					00,3442	0 0008 1	EXTEND
2087	REF	109	LAST	1155	00,3443	10 130 1	DV BUP
2088	REF	194	LAST	1155	00,3444	54 001 1	TS L
2089	REF	110	LAST	1155	00,3445	3 0131 1	CA BUP +1
2090	REF	586	LAST	1155	00,3446	20 155 1	DAS MPAC
2091					00,3447	0 0008 1	EXTEND
2092	REF	1			00,3450	1 3454 0	BZP TCORNK00
2093	REF	34	LAST	1140	00,3451	3 4872 0	CAP POSMAX
2094	REF	587	LAST	1155	00,3452	54 154 0	FIXROOT TS MPAC
2095	REF	588	LAST	1155	00,3453	54 155 1	TS MPAC +1
2096	REF	270	LAST	1154	00,3454	0 0002 0	TCORNK00 TC 0

SEE IF ARGUMENT GREATER THAN OR EQUAL TO
.5.
IF SO, SEE IF LESS THAN .25.

WE WILL TAKE THE SQUARE ROOT OF MPAC/2.
SHIFT RIGHT 1 AND GO TO THE SORT ROUTINE

GUARANTEED NO OVERFLOW.

ARGUMENT BETWEEN .25 AND .5. GET A
LINEAR APPROXIMATION FOR THIS RANGE.

$X0/2 = (MPAC/2)(SLOPHI) + BIASHI/2.$

$X0/2$ (ARGLO ENTERS HERE).
SINGLE-PRECISION THROUGHOUT.

$(MPAC/2)/(X0/2)$

$X1 = X0/2 + .5(MPAC/2)/(X0/2).$

FORM UP $X1/2$.
SAVE AND BRING OUT ARGUMENT.
TAKE DP QUOTIENT WITH $X1$.

SAVE MAJOR PART OF QUOTIENT.
FORM MINOR PART OF QUOTIENT USING
(REMAINDER,0).

IN PREPARATION FOR DAS.

$X2 = X1/2 + (MPAC/2)X1$

OVERFLOWS IF ARG. NEAR POSMAX.

RETURN TO CALLER TO UNNORMALIZE, ETC.

L INTERPRETER

2097	REP	6	LAST	992	00,3455	6 4676 1	SRTTEST	AD	QUARTER
2098					00,3456	0 0006 1		EXTEND	
2099	REP	1			00,3457	6 3501 0		BZMP	SORTNORM
2100	REP	589	LAST	1155	00,3460	52 155 1		DXCH	MPAC
2101	REP	27	LAST	1155	00,3461	22 021 1		LXCH	SR
2102					00,3462	0 0006 1		EXTEND	
2103	REP	19	LAST	1155	00,3463	7 4675 0		MP	HALF
2104	REP	590	LAST	1156	00,3464	52 155 1		DXCH	MPAC
2105	REP	28	LAST	1156	00,3465	56 021 1		XCH	SR
2106	REP	591	LAST	1156	00,3466	26 155 1		ADS	MPAC +1
2107	REP	1			00,3467	3 3007 0	ARGLO	CAP	SLOPELO
2108					00,3470	0 0000 1		EXTEND	
2109	REP	592	LAST	1156	00,3471	7 0154 0		MP	MPAC
2110	REP	1			00,3472	6 2270 0		AD	BIASLO
2111	REP	1			00,3473	1 3422 1		TCP	ARGHI +4
2112					00,3474	0 0006 1	SORTNM2	EXTEND	
2113	REP	593	LAST	1156	00,3475	3 0156 0		DCA	MPAC +1
2114	REP	594	LAST	1156	00,3476	20 156 1		DAS	MPAC +1
2115	REP	595	LAST	1156	00,3477	6 0154 1		AD	MPAC
2116	REP	596	LAST	1156	00,3500	26 154 0		ADS	MPAC
2117	REP	61	LAST	1154	00,3501	24 135 0	SORTNORM	INCR	MPTMP
2118					00,3502	0 0006 1		EXTEND	
2119	REP	597	LAST	1156	00,3503	3 0156 0		DCA	MPAC +1
2120	REP	598	LAST	1156	00,3504	20 156 1		DAS	MPAC +1
2121	REP	599	LAST	1156	00,3505	6 0154 1		AD	MPAC
2122	REP	600	LAST	1156	00,3506	26 154 0		ADS	MPAC
2123					00,3507	6 0000 1		DOUBLE	
2124	REP	19	LAST	373	00,3510	54 022 0		TS	CYL
2125	REP	20	LAST	1156	00,3511	10 022 0	NORMTEST	CCS	CYL
2126	REP	21	LAST	1156	00,3512	10 022 0		CCS	CYL
2127	REP	1			00,3513	1 3474 1		TCP	SORTNM2
2128	REP	2	LAST	1156	00,3514	1 3416 0		TCP	ARGHI
2129	REP	1			00,3515	1 3467 0		TCP	ARGLO

USER=3 PAGE NO. 80 E3 S3

ARGUMENT WAS LESS THAN .5, SEE IF LESS THAN .25.
IF SO, BEGIN NORMALIZATION.

IF BETWEEN .5 AND .25, SHIFT RIGHT 1 AND START AT ARGLO.

NO OVERFLOW.

(NORMALIZED) ARGUMENT BETWEEN .125 AND .25

BEGIN SQUARE ROOT.

SHIFT LEFT 2 AND INCREMENT RIGHT SHIFT COUNT (FOR TERMINAL UNNORMALIZATION).

(NO OVERFLOW).

FIRST TIME THROUGH, JUST SHIFT LEFT 1 (PUTS IN EFFECTIVE RIGHT SHIFT SINCE WE WANT MPAC/2).

(AGAIN NO OVERFLOW).

SEE IF ARGUMENT NOW NORMALIZED AT GREATER THAN .125.
NO - SHIFT LEFT 2 MORE AND TRY AGAIN.
YES - NOW BETWEEN .5 AND .25.
ARGUMENT NOW BETWEEN .25 AND .125.

L INTERPRETER

USER'S PAGE NO. 81 E3 S3

F2130 TRIGONOMETRIC FUNCTION PACKAGE.

R2131 THE FOLLOWING TRIGONOMETRIC FUNCTIONS ARE AVAILABLE AS INTERPRETIVE OPERATIONS:

R2133	1. SIN	COMPUTES (1/2)SINE(2 PI MPAC).
R2134	2. COS	COMPUTES (1/2)COSINE(2 PI MPAC).
R2135	3. ASIN	COMPUTES (1/2PI)ARCSINE(2 MPAC).
R2136	4. ACOS	COMPUTES (1/2PI)ARCCOSINE(2 MPAC).

R2137 SIN-ASIN AND COS-ACOS ARE MUTUALLY INVERSE, IE SIN(ASIN(X)) = X.

2138	REF 4	LAST 1151	00,3516	0 8872 1	COSINE	TC	BRANCH	FINDS COSINE USING THE IDENTITY
2139			00,3517	1 3522 0		TCP	+3	COS(X) = SIN(PI/2 - ABS(X)).
2140	REF 1		00,3520	1 3525 1		TCP	PRESINE	
2141	REF 2	LAST 1157	00,3521	1 3525 1		TCP	PRESINE	
2142			00,3522	0 0008 1	+3	EXTEND		
2143	REF 601	LAST 1156	00,3523	4 0155 1		DCS	MPAC	
2144	REF 602	LAST 1157	00,3524	.52 155 1		DXCH	MPAC	
2145	REF 7	LAST 1156	00,3525	3 4678 1	PRESINE	CAP	QUARTER	PI/2 SCALED.
2146	REF 603	LAST 1157	00,3526	26 154 0		ADS	MPAC	
2147	REF 604	LAST 1157	00,3527	52 155 1	SINE	DXCH	MPAC	DOUBLE ARGUMENT.
2148			00,3530	20 001 1		DOUBLE		
2149			00,3531	54 000 0		O/SK		SEE IF OVERFLOW PRESENT.
2150			00,3532	1 3535 0		TCP	+3	IF NOT, ARGUMENT OK AS IS.
2151			00,3533	0 0008 1		EXTEND		
2152			00,3534	4 0001 1		DCOM		IF SO, WE LOST (OR GAINED) PI, SO
A2153								COMPLEMENT MPAC USING THE IDENTITY
2154	REF 605	LAST 1157	00,3535	52 155 1	+3	DXCH	MPAC	SIN(X-(+)PI) = SIN(-X).
2155	REF 606	LAST 1157	00,3536	3 0154 1		CA	MPAC	
2156			00,3537	6 0000 1		DOUBLE		SEE IF ARGUMENT GREATER THAN .5 IN
2157	REF 195	LAST 1155	00,3540	54 001 1		TS	L	MAGNITUDE. IF SO, REDUCE IT TO LESS THAN
2158	REF 1		00,3541	1 3552 1		TCP	SN1	.5 (+-PI/2 SCALED) AS FOLLOWS:
2159	REF 315	LAST 1154	00,3542	50 000 1		INDEX	A	
2160	REF 7	LAST 1052	00,3543	3 4874 0		CAP	NEG1/2 +1	IF POSITIVE, FORM PI - X, IF NEGATIVE
2161			00,3544	6 0000 1		DOUBLE		USE -PI - X.
2162			00,3545	0 0008 1		EXTEND		
2163	REF 607	LAST 1157	00,3546	60 154 1		SU	MPAC	GUARANTEED NO OVERFLOW.
2164	REF 608	LAST 1157	00,3547	54 154 0		TS	MPAC	
2165	REF 609	LAST 1157	00,3550	4 0155 1		CS	MPAC +1	
2166	REF 610	LAST 1157	00,3551	54 155 1		TS	MPAC +1	



L INTERPRETER

USER=3 PAGE NO. 82 E3 83

2167
2168 REP 611 LAST 1157 00,3552 0 0006 1 SN1
2169 REP 17 LAST 1143 00,3553 3 0155 0
2170 REP 5 LAST 1153 00,3554 52 134 0
00,3555 0 3300 1

EXTEND
DCA MPAC
DXCH BUF2
TC DSQSUB

SET UP TO EVALUATE HASTINGS POLYNOMIAL

SQUARE MPAC.

2171 REP 5 LAST 649 00,3556 0 7171 1
2172 00,3557 00003 1
2173 00,3560 14441 0
2173 00,3561 37325 1
2174 00,3562 53250 0
2174 00,3563 60764 1
2175 00,3564 12146 1
2175 00,3565 21276 1
2176 00,3566 75466 1
2176 00,3567 71471 0
2177 00,3570 00236 0
2177 00,3571 32757 0

TC POLY
DEC 3
ZDEC +.3926990796
ZDEC -.8459637111
ZDEC +.318756717
ZDEC -.074760249
ZDEC +.009894966

EVALUATE FOURTH ORDER POLYNOMIAL.

2178 REP 1
2179 REP 19 LAST 1119 00,3572 3 2470 0
00,3573 0 7055 0

CAP LBUF2
TC DMP2B -1

MULTIPLY BY ARGUMENT AND SHIFT LEFT 2.

2180
2181 REP 612 LAST 1158 00,3574 0 0006 1
2182 REP 613 LAST 1156 00,3575 3 0156 0
2183 REP 614 LAST 1156 00,3576 20 156 1
2184 REP 615 LAST 1156 00,3577 6 0154 1
2185 00,3600 26 154 0
2185 00,3601 0 0006 1
2186 REP 616 LAST 1156 00,3602 3 0156 0
2187 REP 617 LAST 1156 00,3603 20 156 1
2186 REP 616 LAST 1156 00,3604 6 0154 1
2189 REP 619 LAST 1156 00,3605 26 154 0
2190 REP 47 LAST 1152 00,3606 1 6030 0

EXTEND
DCA MPAC +1
DAS MPAC +1
AD MPAC
ADS MPAC
EXTEND
DCA MPAC +1
DAS MPAC +1
AD MPAC
ADS MPAC
TCP DANZIG

NEITHER SHIFT OVERFLOWS.

L INTERPRETER

USER-S PAGE NO. 83 E3 93

P2191 . ARCSIN/ARCCOS ROUTINE.

2192	REF	1	00,3807	3 3830 1	ARCSIN	CAP	LASINEX
2193			00,3810	1 3812 0		TCP	+2
2194	REF	1	00,3811	3 3712 0	ARCCOS	CAP	LDANZIG
2195	REF	1	00,3812	54 138 1		TS	ESCAPE
2196	REF	5	00,3813	0 8872 1		TC	BRANCH
2197	REF	1	00,3814	1 3824 0		TCP	ACOSST
2198	REF	1	00,3815	1 3728 0		TCP	ACOSZERO
2199			00,3816	0 0008 1		EXTEND	
2200	REF	620	00,3817	4 0155 1		DCS	MPAC
2201	REF	621	00,3820	52 155 1		DXCH	MPAC
2202	REF	1	00,3821	3 3731 1		CAP	TCSUBTR
2203	REF	2	00,3822	56 138 0		XCH	ESCAPE
2204	REF	1	00,3823	54 137 0		TS	ESCAPE2
2205	REF	20	00,3824	4 4875 0	ACOSST	CS	HALF
2206	REF	622	00,3825	8 0154 1		AD	MPAC
2207	REF	316	00,3826	10 000 0		CCS	A
2208	REF	1	00,3827	1 3720 0		TCP	ACOSOVF
2209	REF	1	00,3830	1 3706 1	LASINEX	TCP	ASINEX
2210	REF	1	00,3831	1 3841 0		TCP	ACOSST2
2211	REF	623	00,3832	10 155 1		CCS	MPAC +1
2212	REF	238	00,3833	3 4714 1		CAP	ZERO
2213	REF	1	00,3834	1 3836 0		TCP	ACOS=0
2214	REF	2	00,3835	1 3841 0		TCP	ACOSST2
2215	REF	624	00,3838	54 155 1	ACOS=0	TS	MPAC +1
2216	REF	625	00,3837	54 154 0		TS	MPAC
2217	REF	3	00,3840	0 0136 0		TC	ESCAPE
2218			00,3841	0 0008 1	ACOSST2	EXTEND	
2219	REF	626	00,3842	4 0155 1		DCS	MPAC
2220	REF	21	00,3843	8 4875 1		AD	HALF
2221	REF	627	00,3844	52 155 1		DXCH	MPAC
2222	REF	18	00,3845	52 134 0		DXCH	BUF2
2223	REF	3	00,3846	0 3343 0		TC	SQRTSUB
2224	REF	62	00,3847	10 135 1		CCS	MPTEMP
2225	REF	1	00,3850	1 3713 0		TCP	ACOSHR

COMPUTE ARCSIN BY USING THE IDENTITY
 $\text{ARCSIN}(X) = \text{PI}/2 - \text{ARCCOS}(X)$.

(EXITS IMMEDIATELY).

TEST SIGN OF INPUT.
 START IMMEDIATELY IF POSITIVE.
 $\text{ARCCOS}(0) = \text{PI}/2 = .25$.
 IF NEGATIVE, USE THE IDENTITY
 $\text{ARCCOS}(X) = \text{PI} - \text{ARCCOS}(-X)$, FORCING
 ARGUMENT POSITIVE.
 SET EXIT TO DO ABOVE BEFORE
 ARCSIN/ARCCOS CONSIDERATIONS.

TEST MAGNITUDE OF INPUT.

THIS IS PROBABLY AN OVERFLOW CASE.

NO OVERFLOW - PROCEED.

IF MAJOR PART IS .5, CALL ANSWER 0
 UNLESS MINOR PART NEGATIVE.

NOW THAT ARGUMENT IS IN PROPER RANGE,
 BEGIN COMPUTATION. USE HASTINGS
 APPROXIMATION $\text{ARCCOS}(X) = \text{SQRT}(1-X)P(X)$
 IN A SCALED VERSION WHERE $P(X)$ IS A
 SEVENTH ORDER POLYNOMIAL.

RETURNS WITH NORMALIZED SQUARE ROOT.

SEE IF UN-NORMALIZATION REQUIRED.
 IF SO.

L INTERPRETER

USBR=5 PAGE NO. 84 E3 S3

SET UP FOR POLYNOMIAL EVALUATION.

2226	REP 628	LAST 1159	00,3651	52 155 1	ACOS3	DXCH	MPAC	
2227	REP 19	LAST 1159	00,3652	52 134 0		DXCH	BUF2	
2228	REP 629	LAST 1160	00,3653	52 155 1		DXCH	MPAC	
2229	REP 6	LAST 1158	00,3654	0 7171 1		TC	POLY	
2230			00,3655	00006 1		DEC	6	
2231			00,3656	13240 0		ZDEC	+.353553385	COEFFICIENTS ARE C 2(+1)/PISQRT(2) WHERE
2232			00,3657	23630 0				
2233			00,3660	74721 0		ZDEC*	-.0483017006 B+1*	I
2234			00,3661	47775 1				
2235			00,3662	02440 0		ZDEC*	+.0200273085 B+2*	WHERE C STANDS FOR ORIGINAL COEFFS.
2236			00,3663	20237 0				
2237			00,3664	75087 1		ZDEC*	-.0112931863 B+3*	
2238			00,3665	70742 1				
2239			00,3668	03436 0		ZDEC*	+.00895311612 B+4*	
2240			00,3667	28756 1				
2241			00,3670	74037 0		ZDEC*	-.00384617957 B+5*	
2242			00,3671	57840 1				
2243			00,3672	03048 0		ZDEC*	+.001501297738 B+6*	
2244			00,3673	07143 0				
2245			00,3674	76854 1		ZDEC*	-.000284160334 B+7*	
2246			00,3675	42244 0				
2239	REP 2	LAST 1158	00,3676	3 2470 0		CAP	LRUP2	DO FINAL MULTIPLY AND GO TO ANY
2240	REP 20	LAST 1158	00,3677	0 7055 0		TC	DMP SUB -1	EPILOQUE SEQUENCES.
2241	REP 4	LAST 1159	00,3700	0 0136 0		TC	ESCAPE	
2242			00,3701	0 0008 1	SUBTR	EXTEND		EPILOQUE FOR NEGATIVE INPUTS TO ARCCOS.
2243	REP 630	LAST 1160	00,3702	4 0155 1		DCS	MPAC	
2244	REP 22	LAST 1159	00,3703	6 4875 1		AD	HALP	FORMS PI - ARCCOS(-X) = ARCCOS(X).
2245	REP 831	LAST 1160	00,3704	52 155 1		DXCH	MPAC	
2246	REP 2	LAST 1159	00,3705	0 0137 1		TC	ESCAPE2	GO TO POSSIBLE ARCSIN EPILOQUE.
2247			00,3706	0 0008 1	ASINEX	EXTEND		
2248	REP 632	LAST 1160	00,3707	4 0155 1		DCS	MPAC	ARCSIN EPILOQUE - GET ARCSIN(X)
2249	REP 6	LAST 1157	00,3710	6 4876 1		AD	QUARTER	= PI/2 - ARCCOS(X).
2250	REP 633	LAST 1160	00,3711	52 155 1		DXCH	MPAC	
2251	REP 46	LAST 1158	00,3712	1 6030 0	LDANZIG	TCF	DANZIG	



L INTERPRETER

USER'S PAGE NO. 85 E3 S3

2252	REF	317	LAST	1159	00,3713	50 000 1	ACOSSHR	INDEX	A
2253	REF	68	LAST	1148	00,3714	3 4875 1	CAP	BIT14	
2254	REF	63	LAST	1159	00,3715	54 135 1	TS	MPTMP	
2255	REF	4	LAST	1125	00,3716	0 2073 1	TC	VSHRND	
2256	REF	1			00,3717	1 3851 1	TCP	ACOS3	
2257					00,3720	0 0008 1	ACOSVFP	EXTEND	
2258	REF	2	LAST	1159	00,3721	1 3838 0	BZP	ACOS=0	
2259	REF	33	LAST	782	00,3722	0 5537 0	ACOSABRT	TC	ALARM
22591					00,3723	01301 1	OCT	1301	
2260	REF	239	LAST	1159	00,3724	3 4714 1	CAP	ZERO	
22601	REF	3	LAST	1161	00,3725	1 3838 0	TCP	ACOS=0	
2261	REF	9	LAST	1160	00,3726	3 4876 1	ACOSZERO	CAP	QUARTER
2262	REF	4	LAST	1161	00,3727	1 3837 1	TCP	ACOS=0 +1	
2263					00,3730	77763 0	NEG12	DEC	-12
2264	REF	1			00,3731	1 3701 0	TCSUBTR	TCP	SUBTR

THE SHIFT RIGHT IS LESS THAN 14 SINCE
THE INPUT WAS NON-ZERO DP.

DP SHIFT RIGHT AND ROUND.
PROCEED.

IF MAJOR PART WAS ONLY 1 MORE THAN .5,
CALL ANSWER ZERO.

IF OVERFLOW, CALL ANSWER ZERO BUT
SOUND AN ALARM.

ACOS(0) = PI/2.
SET MPAC AND EXIT VIA ESCAPE.



L INTERPRETER

USER=3 PAGE NO. 86 E3 S3

P2265 THE FOLLOWING INSTRUCTIONS ARE AVAILABLE FOR SETTING, MODIFYING, AND BRANCHING ON INDEX REGISTERS'

R2267	1.	AXT	ADDRESS TO INDEX TRUE.	
R2268	1.	AXC	ADDRESS TO INDEX COMPLEMENTED.	
R2269	3.	LXA	LOAD INDEX FROM ERASABLE.	
R2270	4.	LXC	LOAD INDEX COMPLEMENTED FROM ERASABLE.	
R2271	5.	SXA	STORE INDEX IN ERASABLE.	
R2272	6.	XCHX	EXCHANGE INDEX REGISTER WITH ERASABLE.	
R2273	7.	INCR	INCREMENT INDEX REGISTER.	
R2274	8.	XAD	ERASABLE ADD TO INDEX REGISTER.	
R2275	9.	XSU	ERASABLE SUBTRACT FROM INDEX REGISTER.	
R2276	10.	TIX	BRANCH ON INDEX REGISTER AND DECREMENT.	
2277			01,2371	BANK 01
2278	REF	1		COUNT 01/INTER
2279	REF	1	01,2371 0 2466 1	AXT TC TAGSUB
2280	REF	22 LAST 1152	01,2372 3 0117 0	CA POLISH
2281	REF	4 LAST 1081	01,2373 50 130 0	XSTORE INDEX INDEXLOC
2282	REF	50 LAST 1091	01,2374 54 046 1	TS X1
2283	REF	49 LAST 1160	01,2375 1 6030 0	TCP DANZIG
2284	REF	2 LAST 1162	01,2376 0 2466 1	AXC TC TAGSUB
2285	REF	23 LAST 1162	01,2377 4 0117 1	CS POLISH
2286	REF	1	01,2400 0 2373 1	TC XSTORE
2287	REF	1	01,2401 0 2454 0	LXA TC 15ADRRS
2288	REF	24 LAST 1162	01,2402 50 117 0	INDEX POLISH
2289			01,2403 3 0000 1	CA 0
2290	REF	2 LAST 1162	01,2404 1 2373 0	TCP XSTORE
2291	REF	2 LAST 1162	01,2405 0 2454 0	LXC TC 15ADRRS
2292	REF	25 LAST 1162	01,2406 50 117 0	INDEX POLISH
2293			01,2407 4 0000 0	CS 0
2294	REF	3 LAST 1162	01,2410 1 2373 0	TCP XSTORE
2295	REF	3 LAST 1162	01,2411 0 2454 0	SXA TC 15ADRRS
2296	REF	5 LAST 1162	01,2412 50 130 0	INDEX INDEXLOC
2297	REF	51 LAST 1162	01,2413 3 0046 0	CA X1
2298	REF	26 LAST 1162	01,2414 50 117 0	MSTORE1 INDEX POLISH
2299			01,2415 54 000 0	TS 0
2300	REF	50 LAST 1162	01,2416 1 6030 0	TCP DANZIG

SELECT APPROPRIATE INDEX REGISTER.

CONTAINS C(FIXLOC) OR C(FIXLOC)+1.

LOAD INDEX REGISTER FROM ERASABLE.

LOAD NDX REG FROM ERASABLE COMPLEMENTED.

STORE INDEX REGISTER IN ERASABLE.

L INTERPRETER

USER-S PAGE NO. 67 E3 83

2301	REP	4	LAST 1162	01,2417	0 2454 0	XCHX	TC	15ADRRS
2302	REP	27	LAST 1162	01,2420	50 117 0		INDEX	POLISH
2303				01,2421	3 0000 1		CA	0
2304	REP	6	LAST 1162	01,2422	50 130 0		INDEX	INDEXLOC
2305	REP	52	LAST 1162	01,2423	56 046 0		XCH	X1
2306	REP	1		01,2424	1 2414 0		TCP	MSTORE1
2307	REP	5	LAST 1163	01,2425	0 2454 0	XAD	TC	15ADRRS
2308	REP	28	LAST 1163	01,2426	50 117 0		INDEX	POLISH
2309				01,2427	3 0000 1		CA	0
2310	REP	7	LAST 1163	01,2430	50 130 0	XAD2	INDEX	INDEXLOC
2311	REP	53	LAST 1163	01,2431	26 046 1		ADS	X1
2312	REP	51	LAST 1162	01,2432	1 6030 0		TCP	DANZIG
2313	REP	3	LAST 1162	01,2433	0 2466 1	INCR	TC	TAGSUB
2314	REP	29	LAST 1163	01,2434	3 0117 0		CA	POLISH
2315	REP	1		01,2435	1 2430 0		TCP	XAD2
2316	REP	6	LAST 1163	01,2436	0 2454 0	XSU	TC	15ADRRS
2317	REP	30	LAST 1163	01,2437	50 117 0		INDEX	POLISH
2318				01,2440	4 0000 0		CS	0
2319	REP	2	LAST 1163	01,2441	1 2430 0		TCP	XAD2
2320	REP	4	LAST 1163	01,2442	0 2466 1	TIX	TC	TAGSUB
2321	REP	8	LAST 1163	01,2443	50 130 0		INDEX	INDEXLOC
2322	REP	37	LAST 691	01,2444	4 0050 0		CS	S1
2323	REP	9	LAST 1163	01,2445	50 130 0		INDEX	INDEXLOC
2324	REP	54	LAST 1163	01,2446	6 0046 0		AD	X1
2325				01,2447	0 0006 1		EXTEND	
2326	REP	52	LAST 1163	01,2450	6 6030 1		BZMP	DANZIG
2327	REP	10	LAST 1163	01,2451	50 130 0	DOTIXBR	INDEX	INDEXLOC
2328	REP	55	LAST 1163	01,2452	56 046 0		XCH	X1
2329	REP	6	LAST 1152	01,2453	1 6615 1		TCP	GOTO

EXCHANGE INDEX REGISTER WITH ERASABLE.

ADD ERASABLE TO INDEX REGISTER.

IGNORING OVERFLOWS.

INCREMENT INDEX REGISTER.

SUBTRACT ERASABLE FROM INDEX REGISTER.

BRANCH AND DECREMENT ON INDEX.

NO OPERATION IF DECREMENTED INDEX IS
NEGATIVE OR ZERO.

IGNORING OVERFLOWS.

DO THE BRANCH USING THE CADR IN POLISH.



L INTERPRETER

USER-S PAGE NO. 88 E3 S3

P2330

SUBROUTINE TO CONVERT AN ERASABLE ADDRESS (11 BITS) TO AN EBANK SETTING AND SUBADDRESS.

2332	REP	31	LAST 1163	01,2454	4 0117 1	15ADRSRS	CS	POLISH
2333	REP	3	LAST 1091	01,2455	6 4727 1		AD	DEC45
2334	REP	318	LAST 1161	01,2456	10 000 0		CCS	A
2335	REP	31	LAST 1152	01,2457	3 0120 1		CA	FIXLOC
2336				01,2460	1 2465 0		TCP	+5
2337	REP	6	LAST 1091	01,2461	3 4744 1		CA	OCT1400
2338	REP	32	LAST 1164	01,2462	56 117 0		XCH	POLISH
2339	REP	50	LAST 1099	01,2463	54 003 0		TS	EBANK
2340	REP	12	LAST 1099	01,2464	7 4373 0		MASK	LOW8
2341	REP	33	LAST 1164	01,2465	26 117 1	+5	ADS	POLISH

DOES THE ADDRESS POINT TO THE WORK AREA?
YES. ADD FIXLOC. EBANK OK AS IS.

NO. SET EBANK & MAKE UP SUBADDRESS.

FALL INTO TAGSUB, AND RETURN VIA Q.

P2342

SUBROUTINE WHICH SETS THE ADDRESS OF THE SPECIFIED INDEX IN INDEXLOC. (ACTUALLY, THE ADDRESS -38D.)

2344	REP	32	LAST 1164	01,2466	3 0120 1	TAGSUB	CA	FIXLOC
2345	REP	11	LAST 1163	01,2467	54 130 1		TS	INDEXLOC
2346	REP	36	LAST 1131	01,2470	10 020 1		CCS	CYR
2347	REP	12	LAST 1164	01,2471	24 130 0		INCR	INDEXLOC
2348	REP	271	LAST 1155	01,2472	0 0002 0		TC	Q
2349	REP	272	LAST 1164	01,2473	0 0002 0		TC	Q

BIT 15 SPECIFIES INDEX.
0 MEANS USE X2.

1 FOR X1.



L INTERPRETER

USER=8 PAGE NO. 89

E3 53

P2350 MISCELLANEOUS OPERATION CODES WITH DIRECT ADDRESSES. INCLUDED HERE ARE:

R2352	1.	ITA	STORE QPRET (RETURN ADDRESS) IN ERASABLE.
R2354	2.	CALL	CALL A SUBROUTINE, LEAVING RETURN IN QPRET.
R2356	3.	RTB	RETURN TO BASIC LANGUAGE AT THE GIVEN ADDRESS.
R2358	4.	BHIZ	BRANCH IF THE HIGH ORDER OF MPAC IS ZERO (SINGLE PRECISION).
R2360	5.	BOV	BRANCH ON OVERFLOW.
R2361	6.	GOTO	SIMPLE SEQUENCE CHANGE.

2362	REP	37	LAST	1164	01,2474	10 020 1	RTB/BHIZ	CCS	CYR	
2363	REP	34	LAST	1164	01,2475	3 0117 0	RTB	CA	POLISH	
2364	REP	5	LAST	731	01,2476	0 4560 0		TC	SWCALL	-1 SO A ATC Q8 FROM ROUTINE LEADS TO DANZIG
2365	REP	634	LAST	1160	01,2477	10 154 0	BHIZ	CCS	MPAC	
2366	REP	53	LAST	1163	01,2500	1 6030 0		TCP	DANZIG	
2367	REP	7	LAST	1163	01,2501	1 6615 1		TCP	GOTO	
2368	REP	54	LAST	1165	01,2502	1 6030 0		TCP	DANZIG	
2369	REP	8	LAST	1165	01,2503	1 6615 1		TCP	GOTO	
2370	REP	9	LAST	1153	01,2504	10 121 1	BOV(B)	CCS	OVFIND	BRANCH ON OVERFLOW TO BASIC OR INTERP.
2371					01,2505	1 2507 0		TCP	+2	
2372	REP	55	LAST	1165	01,2506	1 6030 0		TCP	DANZIG	
2373	REP	10	LAST	1165	01,2507	54 121 1		TS	OVFIND	
2374	REP	38	LAST	1165	01,2510	10 020 1		CCS	CYR	
2375	REP	1			01,2511	1 2475 1		TCP	RTB	IF BASIC.
2376					01,2512	00360 1	B5TOR8	OCT	360	
2377	REP	9	LAST	1165	01,2513	1 6615 1		TCP	GOTO	



L INTERPRETER

USER'S PAGE NO. 90 E3 S3

2376	REP	39	LAST	1165	01,2514	10 020 1	BZE/GOTO	CCS	CYR
2379	REP	6	LAST	1159	01,2515	0 6672 1		TC	BRANCH
2380	REP	56	LAST	1165	01,2516	1 6030 0		TCP	DANZIG
2381	REP	10	LAST	1165	01,2517	1 6615 1		TCP	GOTO
2382	REP	57	LAST	1166	01,2520	1 6030 0		TCP	DANZIG
2383	REP	40	LAST	1166	01,2521	10 020 1	BPL/RMN	CCS	CYR
2384	REP	1			01,2522	1 2530 1		TCP	BPL
2385					01,2523	12000 1	5B10	DEC	5 B+10
2386	REP	7	LAST	1166	01,2524	0 6672 1		TC	BRANCH
2387	REP	58	LAST	1166	01,2525	1 6030 0		TCP	DANZIG
2388	REP	59	LAST	1166	01,2526	1 6030 0		TCP	DANZIG
2389	REP	11	LAST	1166	01,2527	1 6615 1		TCP	GOTO
2390	REP	6	LAST	1166	01,2530	0 6672 1	BPL	TC	BRANCH
2391	REP	12	LAST	1166	01,2531	1 6615 1		TCP	GOTO
2392	REP	13	LAST	1166	01,2532	1 6615 1		TCP	GOTO
2393	REP	60	LAST	1166	01,2533	1 6030 0		TCP	DANZIG
2394	REP	41	LAST	1166	01,2534	10 020 1	CALL/ITA	CCS	CYR
2395	REP	1			01,2535	1 6607 1		TCP	CALL
2396	REP	7	LAST	357	01,2536	0 5640 0		TC	CCSHOLE
2397	REP	7	LAST	1163	01,2537	0 2454 0		TC	15ADRRERS
2398	REP	33	LAST	1164	01,2540	50 120 1		INDEX	FIXLOC
2399	REP	19	LAST	1152	01,2541	3 0052 0		CA	OPRET
2400	REP	2	LAST	1163	01,2542	1 2414 0		TCP	MSTORE1

SEE WHICH OP-CODE IS DESIRED.
DO BZE.

DO GOTO.

SHIFTS OF CODE IN SWITCH INSTRUCTION ADR

DO RMN.

ONLY IF NNZ.

IF POSITIVE OR ZERO.

STORE OPRET. (TAGSUB AFTER 15ADRRERS IS
SLOW IN THIS CASE, BUT SAVES STORAGE.)



L INTERPRETER

USER=S PAGE NO. 91

E3 S3

P2401

THE FOLLOWING OPERATIONS ARE AVAILABLE FOR ALTERING AND TESTING INTERPRETIVE SWITCHES'

R2403	00	BONSET	SET A SWITCH AND DO A GOTO IF IT WAS ON.
R2404	01	SETGO	SET A SWITCH AND DO A GOTO.
R2405	02	BOFSET	SET A SWITCH AND DO A GOTO IF IT WAS OFF.
R2406	03	SET	SET A SWITCH.

R2407	04	BONINV	INVERT A SWITCH AND BRANCH IF IT WAS ON.
R2408	05	INVGO	INVERT A SWITCH AND DO A GOTO.
R2409	06	BOFINV	INVERT A SWITCH AND BRANCH IF IT WAS OFF.
R2410	07	INVERT	INVERT A SWITCH.

R2411	10	BONCLR	CLEAR A SWITCH AND BRANCH IF IT WAS ON.
R2412	11	CLGOO	CLEAR A SWITCH AND DO A GOTO.
R2413	12	BOFCLR	CLEAR A SWITCH AND BRANCH IF IT WAS OFF.
R2414	13	CLEAR	CLEAR A SWITCH.

R2415	14	BON	BRANCH IF A SWITCH WAS ON.
R2416	16	BOFF	BRANCH IF A SWITCH WAS OFF.
R2417			THE ADDRESS SUPPLIED WITH THE SWITCH INSTRUCTION IS INTERPRETED AS FOLLOWS'

R2419		BITS 1-4	SWITCH BIT NUMBER (1-15).
R2420		BITS 5-8	SWITCH OPERATION NUMBER.
R2421		BITS 9-	SWITCH WORD NUMBER (UP TO 64 SWITCH WORDS).

R2422 THE ADDRESS ITSELF IS MADE UP BY THE YUL SYSTEM ASSEMBLER. THE BRANCH INSTRUCTIONS REQUIRE TWO ADDRESSES, THE SECOND TAKEN AS THE DIRECT (OR INDIRECT IF IN ERASABLE) ADDRESS OF THE BRANCH.

R2424	REF	3	LAST	977	01,2543	3 4721 1	SWITCHES	CAP	LOW4	LEAVE THE SWITCH BIT IN SWBIT
2426	REF	35	LAST	1165	01,2544	7 0117 1		MASK	POLISH	
2427	REF	319	LAST	1164	01,2545	50 000 1		INDEX	A	
2428	REF	46	LAST	1151	01,2546	3 4574 0		CAP	BIT15	(NUMBER FROM LEFT TO RIGHT.)
2429	REF	1			01,2547	54 131 0		TS	SWBIT	

2431	REF	51	LAST	1067	01,2550	3 4704 0		CAP	BIT7	LEAVE THE SWITCH NUMBER IN SWORD.
2432					01,2551	0 0006 1		EXTEND		
2433	REF	36	LAST	1167	01,2552	7 0117 1		MP	POLISH	
2434	REF	1			01,2553	54 130 1		TS	SWORD	

2435					01,2554	0 0004 0		INHINT		
2436	REF	320	LAST	1167	01,2555	50 000 1		INDEX	A	
2437	REF	49	LAST	798	01,2556	3 0074 1		CA	STATE	
2438	REF	273	LAST	1164	01,2557	54 002 1		TS	0	

DURING SWITCH CHANGE SO RUPT CAN USE TOO
LEAVE THE SWITCH WORD ITSELF IN L.

0 WILL BE USED AS A CHANNEL.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1966 SATRAP .007 PAGE 1166

L INTERPRETER

USER=3 PAGE NO. 92 E3 S3

2439	REF	31	LAST 1037	01,2560	3 4700 1		CAF	BIT11
2440				01,2561	0 0006 1		EXTEND	
2441	REF	37	LAST 1167	01,2562	7 0117 1		MP	POLISH
2442	REF	1		01,2563	7 2623 0		MASK	B3TOB4
2443	REF	321	LAST 1167	01,2564	50 000 1		INDEX	A
2444				01,2565	1 2566 1		TCP	+1
2445	REF	2	LAST 1167	01,2566	3 0131 1	+1	CA	SWBIT
2446				01,2567	0 0006 1		EXTEND	
2447	REF	1		01,2570	04 002 1		ROR	QCHAN
2448	REF	1		01,2571	1 2600 1		TCP	SWSTORE
2449	REF	3	LAST 1166	01,2572	3 0131 1	+5	CA	SWBIT
2450				01,2573	0 0006 1		EXTEND	
2451	REF	2	LAST 1166	01,2574	06 002 0		ROR	QCHAN
2452	REF	2	LAST 1166	01,2575	1 2600 1		TCP	SWSTORE
2453	REF	4	LAST 1166	01,2576	4 0131 0	+9D	CS	SWBIT
2454	REF	274	LAST 1167	01,2577	7 0002 1		MASK	0
2455	REF	2	LAST 1167	01,2600	50 130 0	SWSTORE	INDEX	SWWORD
2456	REF	50	LAST 1167	01,2601	54 074 0		TS	STATE

DISPATCH SWITCH BIT OPERATION AS IN BITS
7-8 OF POLISH.
GETS 4X2-BIT CODE.

00 - SET SWITCH IN QUESTION.

01 - INVERT SWITCH.

10 - CLEAR.

NEW SWITCH WORD.



L INTERPRETER

USER'S PAGE NO. 93 E3 S3

2457			01,2602	0 0003 1	+13D	RELINT	
2458	REP 41	LAST 1004	01,2603	3 4676 1		CAP	BIT13
2459			01,2604	0 0006 1		EXTEND	
2460	REP 36	LAST 1168	01,2605	7 0117 1		MP	POLISH
2461	REP 2	LAST 1166	01,2606	7 2623 0		MASK	B3TOB4
2462	REP 322	LAST 1166	01,2607	50 000 1		INDEX	A
2463			01,2610	1 2611 1		TCP	+1
2464	REP 275	LAST 1168	01,2611	4 0002 1	+1	CS	0
2465	REP 5	LAST 1166	01,2612	7 0131 0	TEST	MASK	SWBIT
2466	REP 323	LAST 1169	01,2613	10 000 0		CCS	A
2467	REP 1		01,2614	1 2624 1		TCP	SWSKIP
2468	REP 1		01,2615	1 6664 1	+5	TCP	SWBRANCH
2469	REP 2	LAST 1169	01,2616	1 2624 1		TCP	SWSKIP
2470	REP 8	LAST 1166	01,2617	0 5640 0		TC	CCSHOLE
2471	REP 9	LAST 1169	01,2620	0 5640 0		TC	CCSHOLE
2472	REP 276	LAST 1169	01,2621	3 0002 0	+9D	CA	0
2473	REP 1		01,2622	1 2612 1		TCP	TEST
2474			01,2623	00014 1	B3TOB4	OCT	0014
2475	REP 27	LAST 1100	01,2624	24 164 1	SWSKIP	INCR	LOC
2476	REP 1		01,2543		SW/	EQUALS	SWITCHES
2477	REP 61	LAST 1166	01,2625	1 6030 0	+13D	TCP	DANZIG

11 - NOOP.

DISPATCH SEQUE CHANGING OR BRANCHING CODE.

ORIGINALLY STORED IN BITS 5-6.

00 - BRANCH IF ON.

01 - GO TO.

HERE ONLY ON BIT 15.

10 - BRANCH IF OFF.

11 - NOOP.



L FIXED-FIXED CONSTANT POOL

USER-S PAGE NO. 1 E0 S3

0001 4671 BLOCK 02

00015 REP 1 COUNT 02/PCONS

R00016 THE FOLLOWING TABLE OF 18 VALUES IS INDEXED. DO NOT INSERT OR REMOVE ANY QUANTITIES.

0002	4671	37777	1	DPOSMAX	OCT	37777	MUST PRECEDE POSMAX
0003	4672	37777	1	POS MAX	OCT	37777	

0004	REP	8	LAST 1157	4673	LIMITS	=	NEG ₁ /2
------	-----	---	-----------	------	--------	---	---------------------

0007	4673	57777	1	NEG ₁ /2	OCT	-20000	
------	------	-------	---	---------------------	-----	--------	--

USED BY SIN ROUTINE (MUST BE TWO LOCATIONS IN FRONT OF BIT14)

R0009 BIT TABLE

0010	4674	40000	0	BIT15	OCT	40000	
0011	4675	20000	0	BIT14	OCT	20000	
0012	4676	10000	0	BIT13	OCT	10000	
0013	4677	04000	0	BIT12	OCT	04000	
0014	4700	02000	0	BIT11	OCT	02000	
0015	4701	01000	0	BIT10	OCT	01000	
0016	4702	00400	0	BIT9	OCT	00400	
0017	4703	00200	0	BIT8	OCT	00200	
0018	4704	00100	0	BIT7	OCT	00100	
0019	4705	00040	0	BIT6	OCT	00040	
0020	4706	00020	0	BIT5	OCT	00020	
0021	4707	00010	0	BIT4	OCT	00010	
0022	4710	00004	0	BIT3	OCT	00004	
0023	4711	00002	0	BIT2	OCT	00002	
0024	4712	00001	0	BIT1	OCT	00001	
R0025	DO NOT DESTROY THIS COMBINATION, SINCE IT IS USED IN DOUBLE PRECISION INSTRUCTIONS.						
0027	4713	77777	0	NEG0	OCT	-0	MUST PRECEDE ZERO
0028	4714	00000	1	ZERO	OCT	0	MUST FOLLOW NEG0
A0029				BIT1	OCT	00001	
A0030				NO.WDS	OCT	2	INTERPRETER
A0031				OCTAL3	OCT	3	INTERPRETER
A0032				R3D1	OCT	4	PINBALL
0033	4715	00005	1	FIVE	OCT	5	
A0034				REVONT	OCT	6	INTERPRETER
0035	4716	00007	0	SEVEN	OCT	7	
A0036				BIT4	OCT	00010	
A0037				R2D1	OCT	11	PINBALL
00375	REP	6	LAST 369	4334	OCT11	=	R2D1
A0038					BINCON	DEC	10
0039				4717	00013	0	P20S
A0040					ELEVEN	DEC	11
00401					OCT14	OCT	14
A0041				4720	00015	0	ALARM AND ABORT (FILLER)
					OCT15	OCT	15
					R1D1	OCT	16
							PINBALL

(OCTAL 12)



L FIXED-FIXED CONSTANT POOL

USER'S PAGE NO. 2 E0 S3

0043	4721	00017	1	LOW4	OCT	17
A0044				BIT5	OCT	00020
A0045				MD1	OCT	21
A0046				VD1	OCT	23
A0047				OCT24	OCT	24
A0048				MD1	OCT	25
00485	4722	00030	1	BITS4d5	OCT	30
A0049				OCT31	OCT	31
0050	4723	00032	0	CALLCODE	OCT	00032
A0051				LOW5	OCT	37
A0052				33DEC	DEC	33
A0053				34DEC	DEC	34
0054	4724	00045	0	TRUILLDPX	DEC	37
0055	4725	00048	0	TDECAYPX	DEC	38
A0056				BIT8	OCT	00040
0057	4726	00050	1	OCT50	OCT	50
0058	4727	00055	1	DEC45	DEC	45
0059	4730	00060	1	SUPER011	OCT	60
0060	4731	00062	0	.5SEC	DEC	50
A0061				BIT7	OCT	00100
0082	REF 52 LAST 1167	4704		SUPER100 =	BIT7	
A0063						
0084		4732	00120	1	SUPER101	OCT 120
A0085					OCT121	OCT 121
A0086						
0087		4733	00140	1	SUPER110	OCT 140
A0088						
0089		4734	00144	0	1SEC	DEC 100
A0070					LOW7	OCT 177
A0071					BIT8	OCT 00200
A0072					OT215	OCT 215
A0073					8,5	OCT 00220
0074		4735	00310	0	2SECS	DEC 200
A0075					LOW8	OCT 377
A0076					BIT9	OCT 00400
0077		4736	00401	1	GN/CCODE	OCT 00401
0079		4737	00454	1	3SECS	DEC 300
0080		4740	00820	0	4SECS	DEC 400
00801		4741	00777	0	LOW9	OCT 777
A0081					BIT10	OCT 01000
A0082					5.5DEGS	DEC .03056
A0083					OCT1103	OCT 1103
0084		4742	01124	1	C5/2	DEC .0363551
0085		4743	01211	1	V05N09	VN 0509
0086		4744	01400	1	OCT1400	OCT 01400
00865		4745	01428	0	V08N22	VN 0822
A0087					MID5	OCT 1740
00875		4748	01778	0	BIT52-10	OCT 1776
0088		4747	01777	1	LOW10	OCT 1777

PINBALL
PINBALL
SERVICE ROUTINES
PINBALL

SERVICE ROUTINES

PINBALL
PINBALL (OCTAL 41)
PINBALL (OCTAL 42)
BUILDUP FOR CONVIENCE IN DAPTESTING
CONVIENCE FOR DAPTESTING

BITS FOR SUPERBNK SETTING 011.

BITS FOR SUPERBNK SETTING 100
(LAST 4K OF ROPE)
BITS FOR SUPERBNK SETTING 101
SERVICE ROUTINES
(FIRST 8K OF ACM)
BITS FOR SUPERBNK SETTING 110.
(LAST 8K OF ACM)

INTERPRETER

ALARM AND ABORT
P20-P25 SUNDANCE

PINBALL

SET S/C CONTROL SWITCH TO G/N

P20-P25 SUNDANCE (OCTAL 00785)
ALARM AND ABORT (OCTAL 01124)
(SAME AS OCTAL 1211)

PINBALL



L FIXED-FIXED CONSTANT POOL

USER-S PAGE NO. 3 E0 S3

A0089			BIT11	OCT	02000
A0090			2K+3	OCT	2003
0091	4750	02177 1	LOW7+2K	OCT	2177
0092	4751	02400 1	EBANK5	OCT	02400
0093	4752	03000 1	PRIO3	OCT	03000
0094	4753	03400 0	EBANK7	OCT	03400
A0095			LOW11	OCT	3777
A0096			BIT12	OCT	04000
A0097			RELTAB	OCT	04025
0098	4754	05000 1	PRIO5	OCT	05000
0099	4755	06000 1	PRIO6	OCT	06000
0100	4756	07000 0	PRIO7	OCT	07000
A0102			BIT13	OCT	10000
A0103				OCT	10003
A0104			13,7,2	OCT	10102
0105	4757	11000 1	PRIO11	OCT	11000
A0106			PRIO12	OCT	12000
0107	4760	13000 0	PRIO13	OCT	13000
0108	4761	14000 1	PRIO14	OCT	14000
A0109				OCT	14031
0110	4762	15000 0	PRIO15	OCT	15000
0111	4763	16000 0	PRIO16	OCT	16000
A0112			85DEC8	DEC	.45556
0113	4764	17000 1	PRIO17	OCT	17000
0114	4765	17770 1	OCT17770	OCT	17770
A0115			BIT14	OCT	20000
A0116				OCT	20033
0117	4766	21000 1	PRIO21	OCT	21000
01175	7657		BLOCK	03	
01176			COUNT	03/PCONS	
0118	7657	22000 1	PRIO22	OCT	22000
0119	7660	23000 0	PRIO23	OCT	23000
0120	7661	24000 1	PRIO24	OCT	24000
A0121			5/6+1	OCT	24001
A0122				OCT	24017
0123	7662	25000 0	PRIO25	OCT	25000
0124	7663	26000 0	PRIO26	OCT	26000
0125	7664	27000 1	PRIO27	OCT	27000
A0126			CHRPRIO	OCT	30000
A0127				OCT	30036
0128	7665	31000 0	PRIO31	OCT	31000
0129	7666	31103 1	C1/2	DEC	.7853134
0130	7667	32000 0	PRIO32	OCT	32000
0131	7670	33000 1	PRIO33	OCT	33000
0132	7671	34000 0	PRIO34	OCT	34000
A0133				OCT	34034
0134	7672	35000 1	PRIO35	OCT	35000
0135	7673	36000 1	PRIO36	OCT	36000

PINBALL
OP CODE MASK + BANK 1 FBANK SETTING.

PINBALL

T4RUPT

T4RUPT RELTAB +1D
P20-P25 SUNDANCE

BANKCALL

T4RUPT RELTAB +2D

P20-P25 SUNDANCE (OCTAL 16450)

T4RUPT RELTAB +3D

SERVICE ROUTINES

SINGLE PRECISION SUBROUTINES
T4RUPT RELTAB +4D

PINBALL

T4RUPT RELTAB +5D

(OCTAL 31103)

T4RUPT RELTAB +6D



L FIXED-FIXED CONSTANT POOL

USER=5 PAGE NO. 4 EQ S3

0136	7674	37000	0	PRI037	OCT	37000
0137	7675	37401	0	63/64+1	OCT	37401
A0136				MID7	OCT	37600
0139	7676	37766	1	OCT37766	OCT	37766
0140	7677	37774	1	OCT37774	OCT	37774
0141	7700	37776	0	OCT37776	OCT	37776
A01411				DPOS4X	OCT	37777
A0142				BIT15	OCT	40000
A0143				OCT40001	OCT	40001
0144	7701	40014	0	DLOADCOD	OCT	40014
0145	7702	40015	1	DLOAD*	OCT	40015
A0146					OCT	40023
01465	7703	40040	1	BIT15+6	OCT	40040
01466	7704	40200	1	OCT40200	OCT	40200
A0147					OCT	44035
A0148					OCT	50037
A0149					OCT	54000
01495	7705	57777	1	-BIT14	OCT	57777
A0150				RELTAB11	OCT	60000
0151	7706	65552	0	C3/2	DEC	-.3216147
0152	7707	70000	0	13,14,15	OCT	70000
0153	7710	73777	1	-1/8	OCT	73777
0154	7711	74000	1	HIGH4	OCT	74000
0155	7712	74056	1	-ENDERS	DEC	-2001
A0156				HI5	OCT	76000
0157	7713	77700	0	HIGH9	OCT	77700
A0158				-ENDVAC	DEC	-45
A0159				-OCT10	OCT	-10
A0161				NEG4	DEC	-4
0162	7714	77774	0	NEG3	DEC	-3
0163	7715	77775	1	NEG2	OCT	77775
0164	7716	77776	1	NEGONE	DEC	-1

PINBALL

INTERPRETER (CS 1 INSTRUCTION)

T4RUPT RELTAB +7D

T4RUPT RELTAB +8D

T4RUPT RELTAB +9D

T4RUPT RELTAB +10D

T4RUPT

(OCTAL 65552)

PINBALL

(OCTAL 74056)

INTERPRETER

(OCTAL 77722)

(OCT 77767)

(OCTAL 77773)



L FIXED-FIXED CONSTANT POOL

USER'S PAGE NO. 5 E0 S3

P0165 DEFINED BY EQUALS

R0166 IT WOULD BE TO THE USERS ADVANTAGE TO OCCASIONALLY CHECK ANY OF THESE SYMBOLS IN ORDER TO PREVENT ANY
R0166 ACCIDENTAL DEFINITION CHANGES.

0169	REP	5	LAST	330	7716	MINUS1	=	NEG1
0170	REP	26	LAST	1134	7716	NEG1	=	NEGOONE
0171	REP	75	LAST	1079	4712	ONE	=	BIT1
0172	REP	43	LAST	1059	4711	TWO	=	BIT2
0173	REP	1			6214	THREE	=	OCTAL3
0174	REP	41	LAST	1103	6214	LOW2	=	THREE
0175	REP	32	LAST	1045	4710	FOUR	=	BIT3
0176	REP	2	LAST	1063	6211	SIX	=	REVONT
0177	REP	17	LAST	1154	4716	LOW3	=	SEVEN
0178	REP	39	LAST	1051	4707	EIGHT	=	BIT4
0179	REP	7	LAST	1170	4334	NINE	=	R201
0180	REP	3	LAST	361	4377	TEN	=	BINCON
0181	REP	9	LAST	1030	4717	NOUTCQN	=	ELEVEN
0182	REP	16	LAST	902	4374	OCT23	=	VD1
01825	REP	2	LAST	370	4376	OCT25	=	MD1
0183	REP	36	LAST	1130	4701	PRI01	=	BIT10
0184	REP	7	LAST	1164	4744	EBANK3	=	OCT1400
0185	REP	32	LAST	1166	4700	PRI02	=	BIT11
0186	REP	1			4732	OCT120	=	SUPER101
0187	REP	1			4733	OCT140.	=	SUPER110
0188	REP	33	LAST	1174	4700	ZK	=	BIT11
0189	REP	34	LAST	1174	4700	EBANK4	=	BIT11
0190	REP	30	LAST	1043	4677	PRI04	=	BIT12
0191	REP	2	LAST	496	4752	EBANK6	=	PRI03
0192	REP	42	LAST	1169	4676	QUARTER	=	BIT13
0193	REP	43	LAST	1174	4676	PRI010	=	BIT13
01935	REP	1			7632	OCT10001	=	CCSL
0194	REP	23	LAST	1160	4675	POS1/2	=	HALF
0195	REP	69	LAST	1161	4675	PRI020	=	BIT14
0196	REP	70	LAST	1174	4675	HALP	=	BIT14
0197	REP	5	LAST	360	4371	PRI030	=	CHRPRI0
0198	REP	13	LAST	1101	4371	BIT13-14	=	PRI030
01965	REP	3	LAST	1066	6440	OCT30002	=	TLOAD +1
0199	REP	8	LAST	1071	7671	B12T14	=	PRI034
0200	REP	47	LAST	1167	4674	NEQMAX	=	BIT15
0201	REP	48	LAST	1174	4674	VLOADCDD	=	BIT15
0202	REP	1			6056	VLOAD*	=	OCT40001
0203	REP	3	LAST	536	4105	OCT60000	=	RELTAB11
0204	REP	5	LAST	326	4364	BANKMASK	=	H15

INTERPRETER USES IN PROCESSING STORECODE



L INTERPRETIVE CONSTANTS

USER-S PAGE NO. 1 E0 S3

0001	REP	1	26,2000				SETLOC	INTERPRET1
0002			26,3321				BANK	
0003	REP	1					COUNT	23/ICONS
0004			26,3321	10000	0	DP1/4TH	2DEC	.25
0004			26,3322	00000	1			
0005			26,3323	00000	1	UNITZ	2DEC	0
0005			26,3324	00000	1			
0006			26,3325	00000	1	UNITY	2DEC	0
0006			26,3326	00000	1			
0007			26,3327	20000	0	UNITX	2DEC	.5
0007			26,3330	00000	1			
0008			26,3331	00000	1	ZEROVECS	2DEC	0
0008			26,3332	00000	1			
0009			26,3333	00000	1		2DEC	0
0009			26,3334	00000	1			
0010			26,3335	00000	1		2DEC	0
0010			26,3336	00000	1			
0011	REP	7	LAST	672		DPHALP	=	UNITX
0012			26,3327			DPPOS4X	OCT	37777
0012			26,3337	37777	1		OCT	37777
0013			26,3340	37777	1			

USER'S PAGE NO. 2 E0 S3

0015	REP	1	04,2000	SETLOC	INTERPRET2
0016			04,3447	BANK	
0017	REP	1		COUNT	14/ICONS
0018			04,3447	00000 1	ZUNIT
0018			04,3450	00000 1	ZDEC
0019			04,3451	00000 1	YUNIT
0019			04,3452	00000 1	ZDEC
0020			04,3453	20000 0	XUNIT
0020			04,3454	00000 1	ZDEC
0021			04,3455	00000 1	ZEROVEC
0021			04,3456	00000 1	ZDEC
0022			04,3457	00000 1	ZDEC
0022			04,3460	00000 1	ZDEC
0023			04,3461	00000 1	ZDEC
0023			04,3462	00000 1	ZDEC
0024			04,3463	77777 0	OCT
0025			04,3464	77771 0	DEC-8
0026			04,3465	77763 0	DEC-12
0027			04,3466	37777 1	LODRMAX
0027			04,3467	37777 1	ZOCT
0028			04,3470	37777 1	LODRMAX1
0028			04,3471	37777 1	ZOCT
0029	REP	5 LAST	04,3455	ZERODP	= ZEROVEC
0030	REP	3 LAST	04,3453	HALFDP	= XUNIT

-0,-8,-12 MUST REMAIN IN THIS ORDER

THESE TWO CONSTANTS MUST REMAIN

ADJACENT AND THE SAME FOR INTEGRATION

L SINGLE PRECISION SUBROUTINES

USER=S PAGE NO. 1 EO S3

0001 4767
R0002 SINGLE PRECISION SINE AND COSINE

BLOCK 02

00025	REP	1					COUNT	02/INTER	
0003	REP	24	LAST 1174	4767	6 4675 1	SPCOS	AD	HALF	ARGUMENTS SCALED AT PI
0004	REP	1		4770	55=075 0	SPSIN	TS	TEMK	
0005	REP	1		4771	1 4773 1		TOP	SPT	
0006	REP	2	LAST 1177	4772	4 1075 0		CS	TEMK	
0007				4773	6 0000 1	SPT	DOUBLE		
0008	REP	3	LAST 1177	4774	55=075 0		TS	TEMK	
0009	REP	1		4775	1 5006 0		TOP	POLLEY	
0010	REP	4	LAST 1177	4776	57=075 1		XCH	TEMK	
0011	REP	5	LAST 1177	4777	51=075 1		INDEX	TEMK	
0012	REP	6	LAST 1103	5000	6 4673 1		AD	LIMITS	
0013				5001	4 0000 0		COM		
0014	REP	6	LAST 1177	5002	6 1075 1		AD	TEMK	
0015	REP	7	LAST 1177	5003	55=075 0		TS	TEMK	
0016	REP	2	LAST 1177	5004	1 5006 0		TOP	POLLEY	
0017	REP	1		5005	1 5024 0		TOP	ARG90	
0018				5006	0 0006 1	POLLEY	EXTEND		
0019	REP	8	LAST 1177	5007	7 1075 0		MP	TEMK	
0020	REP	1		5010	55=076 0		TS	SO	
0021				5011	0 0006 1		EXTEND		
0022	REP	1		5012	7 4742 0		MP	C5/2	
0023	REP	1		5013	6 7706 1		AD	C3/2	
0024				5014	0 0006 1		EXTEND		
0025	REP	2	LAST 1177	5015	7 1076 0		MP	SO	
0026	REP	1		5016	6 7666 0		AD	C1/2	
0027				5017	0 0006 1		EXTEND		
0028	REP	9	LAST 1177	5020	7 1075 0		MP	TEMK	
0029				5021	20 001 1		DOUBLE		
0030	REP	10	LAST 1177	5022	55=075 0		TS	TEMK	
0031	REP	277	LAST 1169	5023	0 0002 0		TC	Q	
0032	REP	324	LAST 1169	5024	50 000 1	ARG90	INDEX	A	
0033	REP	7	LAST 1177	5025	4 4673 0		CS	LIMITS	
0034	REP	278	LAST 1177	5026	0 0002 0		TC	Q	
R0040									RESULT SCALED AT 1

SPROUT WAS DELETED IN REV 51 OF MASTER. ASS. CONT. HAS CARDS.



L EXECUTIVE

USER-S PAGE NO. 1 E0 S3

0001 5027 BLOCK 02
R0002 TO ENTER A JOB REQUEST REQUIRING NO VAC AREA'
00025 RESP 1 COUNT 02/EXEC
00029 5027 0 0004 0 NOVAC INHINT
0003 RESP 1 5030 6 5121 0 AD FAKEPRET
00031 RESP 3 LAST 411 5031 54 063 0 TS NEWPRIO
0004 5032 0 0006 1 EXTEND
0005 RESP 279 LAST 1177 5033 5 0002 0 INDEX 0
0006 5034 3 0001 0 DCA 0
0007 RESP 1 5035 52 086 0 DXCH NEWLOC
0008 RESP 1 5036 3 5120 1 CAP EXECBANK
0009 RESP 24 LAST 1120 5037 56 004 0 XCH FBANK
0010 RESP 1 5040 54 081 1 TS EXECTEM1
0011 RESP 1 5041 1 2650 1 TCF NOVAC2

LOC(MPAC +6) - LOC(OPRET)
PRIORITY OF NEW JOB + NOVAC C(FIXLOC)0 WILL BE UNDISTURBED THROUGHOUT.
2CADR OF JOB ENTERED.

ENTER EXECUTIVE BANK.

R0012 TO ENTER A JOB REQUEST REQUIRING A VAC AREA - E.G., ALL (PARTIALLY) INTERPRETIVE JOBS.

0014 5042 0 0004 0 FINDVAC INHINT
00145 RESP 4 LAST 1178 5043 54 063 0 TS NEWPRIO
0015 5044 0 0006 1 EXTEND
0016 RESP 280 LAST 1178 5045 5 0002 0 INDEX 0
0017 5046 3 0001 0 DCA 0
0018 RESP 2 LAST 1178 5047 52 086 0 SPVACIN DXCH NEWLOC
0019 RESP 2 LAST 1178 5050 3 5120 1 CAP EXECBANK
0020 RESP 25 LAST 1178 5051 56 004 0 XCH FBANK
0021 RESP 1 5052 1 2626 0 TCF FINDVAC2

OFF TO EXECUTIVE SWITCHED-BANK.

R00211 TO ENTER A FINDVAC WITH THE PRIORITY IN NEWPRIO TO THE 2CADR ARRIVING IN A AND L'

R002125 USERS OF SPVAC MUST INHINT BEFORE STORING IN NEWPRIO.

00213 RESP 281 LAST 1178 5053 58 002 0 SPVAC XCH 0
00214 RESP 5 LAST 1020 5054 8 7715 0 AD NEG2
00215 RESP 282 LAST 1178 5055 58 002 0 XCH 0
00216 RESP 1 5056 1 5047 0 TCF SPVACIN

R0022 TO SUSPEND A BASIC JOB SO A HIGHER PRIORITY JOB MAY BE SERVICED'

0024 RESP 283 LAST 1178 5057 22 002 0 CHANG1 LXCH 0
0025 RESP 3 LAST 1178 5060 3 5120 1 CAP EXECBANK
0026 RESP 20 LAST 1100 5061 56 006 1 XCH BBANK
0027 RESP 1 5062 1 2727 0 TCF CHANJOB

R0030 TO SUSPEND AN INTERPRETIVE JOB'

0031 RESP 28 LAST 1169 5063 4 0164 0 CHANG2 CS LOC
R00315 ITRACE (4) REFERS TO CHANG28.

NEGATIVE LOC SHOWS JOB = INTERPRETIVE.



L EXECUTIVE

USER=3 PAGE NO. 2 E0 33

0032	REP	196	LAST	1157	5064	54	001	1	TS	L
0033	REP	4	LAST	1178	5065	3	5120	1	CAP	EXCBANK
00335	REP	21	LAST	1178	5066	54	006	0	TS	BBANK
0034	REP	2	LAST	1178	5067	1	2726	1	TCP	CHANJOB -1



L EXECUTIVE

USER'S PAGE NO. 3 E0 S3

P0035 TO VOLUNTARILY SUSPEND A JOB UNTIL THE COMPLETION OF SOME ANTICIPATED EVENT (I/O EVENT ETC.)

0037	REF	29	LAST 1178	5070	54 164 0	JOB SLEEP	TS	LOC
0038	REF	5	LAST 1179	5071	3 5120 1		CAP	EXECBANK
0039	REF	26	LAST 1178	5072	54 004 1		TS	FRANK
0040	REF	1		5073	1 3017 0		TCP	JOB SLP1

R0041 TO AWAKEN A JOB PUT TO SLEEP IN THE ABOVE FASHION

0042				5074	0 0004 0	JOB WAKE	INHINT	
00421	REF	3	LAST 1178	5075	54 085 0		TS	NEWLOC
0043	REF	59	LAST 1117	5078	4 4711 0		CS	TWO
0044	REF	284	LAST 1178	5077	28 002 1		ADS	Q
0045	REF	6	LAST 1180	5100	3 5120 1		CAP	EXECBANK
0046	REF	27	LAST 1180	5101	58 004 0		XCH	FRANK
0047	REF	1		5102	1 3044 0		TCP	JOB WAKE2

EXIT IS VIA PINDVAC/NOVAC PROCEDURES.

R0048 TO CHANGE THE PRIORITY OF A JOB CURRENTLY UNDER EXECUTION

0049				5103	0 0004 0	PRIORCHG	INHINT	
0050	REF	5	LAST 1178	5104	54 083 0		TS	NEWPRIO
0051	REF	7	LAST 1180	5105	3 5120 1		CAP	EXECBANK
0052	REF	22	LAST 1179	5108	58 008 1		XCH	FRANK
0053	REF	9	LAST 1100	5107	54 185 1		TS	BANKSET
0054	REF	285	LAST 1180	5110	3 0002 0		CA	Q
0055	REF	1		5111	1 3113 0		TCP	PRIORCH2

NEW PRIORITY ARRIVES IN A. RETURNS TO CALLER AS SOON AS NEW JOB PRIORITY IS HIGHEST. PREPARE FOR POSSIBLE BASIC-STYLE CHANGE-JOB.

R0058 TO REMOVE A JOB FROM EXECUTIVE CONSIDERATIONS

0059	REF	8	LAST 1180	5112	3 5120 1	ENDOFJOB	CAP	EXECBANK
0060	REF	28	LAST 1180	5113	54 004 1		TS	FRANK
0061	REF	1		5114	1 3124 1		TCP	ENDJOB1
0062	REF	2	LAST 1178	5115	3 0081 0	ENDFIND	CA	EXECITEM1
0063	REF	29	LAST 1180	5116	54 004 1		TS	FRANK
0064	REF	1		5117	1 6710 0		TCP	Q+2
0066	REF	2	LAST 1178	5120	02628 1	EXECBANK	CADR	PINDVAC2

RETURN TO CALLER AFTER JOB ENTRY COMPLETE.

00665 REF 635 LAST 1165 5121 00110 1 PAKEPRET ADRES MPAC -36D

LOC(MPAC +6) - LOC(OPRET)

L EXECUTIVE

USER'S PAGE NO. 4 E0 S3

P0067 LOCATE AN AVAILABLE VAC AREA.

0066				01,2628		BANK	01
00685	REF	1				COUNT	01/EXEC
0069	REF	3	LAST 1180	01,2626	54 061 1	PINDVAC2	TS EXECITEM1
0070	REF	4	LAST 217	01,2627	10 400 1	CCS	VAC1USE
0071	REF	1		01,2630	1 2643 0	TCP	VACFOUND
0072	REF	3	LAST 217	01,2631	10 454 0	CCS	VAC2USE
0073	REF	2	LAST 1181	01,2632	1 2643 0	TCP	VACFOUND
0074	REF	3	LAST 217	01,2633	10 530 0	CCS	VAC3USE
0075	REF	3	LAST 1181	01,2634	1 2643 0	TCP	VACFOUND
0076	REF	3	LAST 217	01,2635	10 604 1	CCS	VAC4USE
0077	REF	4	LAST 1181	01,2636	1 2643 0	TCP	VACFOUND
0078	REF	3	LAST 217	01,2637	10 660 0	CCS	VAC5USE
0079	REF	5	LAST 1181	01,2640	1 2643 0	TCP	VACFOUND
0080	REF	4	LAST 561	01,2641	0 5604 0	TC	BAILOUT
0081				01,2642	01201 0	OCT	1201
0082	REF	60	LAST 1180	01,2643	6 4711 1	VACFOUND	AD TWO
0083				01,2644	22 007 0	ZL	
0084	REF	325	LAST 1177	01,2645	50 000 1	INDEX	A
0085				01,2646	21-777 0	LXCH	0 -1
0086	REF	6	LAST 1160	01,2647	26 063 0	ADS	NEWPRIO
0087	REF	240	LAST 1181	01,2650	3 4714 1	NOVAC2	CAP ZERO
0088	REF	5	LAST 415	01,2651	54 064 1	TS	LOCCTR
0089	REF	1		01,2652	3 2657 1	CAP	NO.CORES
0090	REF	1		01,2653	54 062 1	NOVAC3	TS EXECITEM2
0091	REF	6	LAST 1181	01,2654	50 064 0	INDEX	LOCCTR
0092	REF	8	LAST 187	01,2655	10 167 0	CCS	PRIORITY
0093	REF	1		01,2656	1 2717 0	TCP	NEXTCORE
0094				01,2657	00006 1	NO.CORES	DEC 6
0095	REF	2	LAST 1161	01,2660	1 2717 0	TCP	NEXTCORE

A0096

(SAVE CALLER'S BANK FIRST.)

NO VAC AREAS.

RESERVE THIS VAC AREA BY STORING A ZERO IN ITS VAC USE REGISTER AND STORE THE ADDRESS OF THE FIRST WORD OF IT IN THE LOW NINE BITS OF THE PRIORITY WORD.

NOVAC ENTERS HERE. FIND A CORE SET.

SEVEN SETS OF ELEVEN REGISTERS EACH.

EACH PRIORITY REGISTER CONTAINS -0 IF THE CORRESPONDING CORE SET IS AVAILABLE.

AN ACTIVE JOB HAS A POSITIVE PRIORITY BUT A DORMANT JOB'S PRIORITY IS NEGATIVE

L EXECUTIVE

0097	REP	7	LAST	1181	01,2661	3 0063 1	CORFOUND	CA	NEWPRIO
0098	REP	7	LAST	1181	01,2662	50 064 0	INDEX	LOCCTR	
0099	REP	9	LAST	1181	01,2663	54 167 0	TS	PRIORITY	
0100	REP	4	LAST	228	01,2664	7 4741 0	MASK	LOC9	
0101	REP	6	LAST	1182	01,2665	50 064 0	INDEX	LOCCTR	
0102	REP	19	LAST	1152	01,2666	54 166 1	TS	PUSHLOC	
0103	REP	9	LAST	1162	01,2667	10 064 1	CCS	LOCCTR	
0104	REP	1			01,2670	1 2704 1	TCP	SETLOC	
0105	REP	11	LAST	1165	01,2671	54 121 1	TS	OVFIND	
0106	REP	20	LAST	1182	01,2672	3 0166 0	CA	PUSHLOC	
0107	REP	34	LAST	1166	01,2673	54 120 0	TS	FIXLOC	
0108	REP	6	LAST	1078	01,2674	10 067 1	SPECTEST	CCS	NEWJOB
0109	REP	2	LAST	1182	01,2675	1 2704 1	TCP	SETLOC	
0110	REP	10	LAST	1169	01,2676	0 5640 0	TC	CCSHOLE	
0111	REP	11	LAST	1182	01,2677	0 5640 0	TC	CCSHOLE	
0112	REP	7	LAST	1182	01,2700	54 067 1	TS	NEWJOB	
0113	REP	4	LAST	1180	01,2701	52 066 0	DXCH	NEWLOC	
0114	REP	30	LAST	1180	01,2702	52 165 1	DXCH	LOC	
0115	REP	1			01,2703	1 5115 0	TCP	ENDFIND	
0116	REP	5	LAST	1182	01,2704	52 066 0	SETLOC	DXCH	NEWLOC
0117	REP	10	LAST	1182	01,2705	50 064 0	INDEX	LOCCTR	
0118	REP	31	LAST	1182	01,2706	52 165 1	DXCH	LOC	
0119	REP	8	LAST	1182	01,2707	50 067 0	INDEX	NEWJOB	
0120	REP	10	LAST	1182	01,2710	4 0167 0	CS	PRIORITY	
0121	REP	8	LAST	1182	01,2711	6 0063 1	AD	NEWPRIO	
0122	REP	2	LAST	1182	01,2712	0 0006 1	EXTEND		
0123	REP	11	LAST	1182	01,2713	6 5115 1	BZMF	ENDFIND	
0124	REP	9	LAST	1182	01,2714	3 0064 0	CA	LOCCTR	
0125	REP	3	LAST	1182	01,2715	54 067 1	TS	NEWJOB	
0126	REP	1			01,2716	1 5115 0	TCP	ENDFIND	
0127	REP	12	LAST	1182	01,2717	3 3054 0	NEXTCORE	CAP	COREINC
0128	REP	2	LAST	1181	01,2720	28 064 1	ADS	LOCCTR	
0129	REP	1			01,2721	10 062 1	CCS	EXECUTE2	
0130	REP	5	LAST	1181	01,2722	1 2653 1	TCP	NOVAC3	
0131	REP	1			01,2723	0 5604 0	TC	BAILOUT	
0132					01,2724	01202 0	OCT	1202	

USER=S PAGE NO. 5 E9 S3

SET THE PRIORITY OF THIS JOB IN THE CORE
SET=S PRIORITY REGISTER AND SET THE
JOB=S PUSH-DOWN POINTER AT THE BEGINNING
OF THE WORK AREA AND OVERFLOW INDICATOR

OFF TO PREPARE FOR INTERPRETIVE PROGRAMS

IF CORE SET ZERO IS BEING LOADED, SET UP
OVFINO AND FIXLOC IMMEDIATELY

SEE IF ANY ACTIVE JOBS WAITING (RARE).
MUST BE AWAKENED BUT UNCHANGED JOB.

+0 SHOWS ACTIVE JOB ALREADY SET.

SET UP THE LOCATION REGISTERS FOR THIS

THIS INDEX INSTRUCTION INSURES THAT THE
HIGHEST ACTIVE PRIORITY WILL BE COMPARED
WITH THE NEW PRIORITY TO SEE IF NEWJOB
SHOULD BE SET TO SIGNAL A SWITCH.

LOCCTR IS LEFT SET AT THIS CORE SET IF
THE CALLER WANTS TO LOAD ANY MPAC
REGISTERS, ETC.

NO CORE SETS.



L EXECUTIVE

USER=3 PAGE NO. 6 E0 S3

P0133 THE FOLLOWING ROUTINE SWAPS CORE SET 0 WITH THAT WHOSE RELATIVE ADDRESS IS IN NEWJOB.

01345	REF	32	LAST	1182	01,2725	22 164 1	-2	LXCH	LOC	
0135	REF	10	LAST	1180	01,2726	30 185 0	-1	CAE	BANKSET	BANKSET, NOT BRANK, HAS RIGHT CONTENTS.
0136					01,2727	0 0004 0	CHANJOB	INHINT		
01362					01,2730	0 0008 1		EXTEND		
01364	REF	14	LAST	1078	01,2731	04 007 1		ROR	SUPERBANK	PICK UP CURRENT SBANK FOR BBCON
01366	REF	197	LAST	1179	01,2732	58 001 0		XCH	L	LOC IN A AND BBCON IN L.
01368	REF	10	LAST	1182	01,2733	50 067 0	+4	INDEX	NEWJOB	SWAP LOC AND BANKSET.
0137	REF	33	LAST	1183	01,2734	52 185 1		DXCH	LOC	
0138	REF	34	LAST	1183	01,2735	52 165 1		DXCH	LOC	
01382	REF	11	LAST	1183	01,2736	30 185 0		CAE	BANKSET	
01384					01,2737	0 0008 1		EXTEND		
01388	REF	15	LAST	1183	01,2740	01 007 1		WRITE	SUPERBANK	SET SBANK FOR NEW JOB.
0139	REF	638	LAST	1180	01,2741	52 155 1		DXCH	MPAC	SWAP MULTI-PURPOSE ACCUMULATOR AREAS.
0140	REF	11	LAST	1183	01,2742	50 067 0		INDEX	NEWJOB	
0141	REF	637	LAST	1183	01,2743	52 155 1		DXCH	MPAC	
0142	REF	638	LAST	1183	01,2744	52 155 1		DXCH	MPAC	
0143	REF	639	LAST	1183	01,2745	52 157 0		DXCH	MPAC +2	
0144	REF	12	LAST	1183	01,2748	50 067 0		INDEX	NEWJOB	
0145	REF	840	LAST	1183	01,2747	52 157 0		DXCH	MPAC +2	
0146	REF	641	LAST	1183	01,2750	52 157 0		DXCH	MPAC +2.	
0147	REF	642	LAST	1183	01,2751	52 161 0		DXCH	MPAC +4	
0148	REF	13	LAST	1183	01,2752	50 067 0		INDEX	NEWJOB	
0149	REF	843	LAST	1183	01,2753	52 161 0		DXCH	MPAC +4	
0150	REF	644	LAST	1183	01,2754	52 161 0		DXCH	MPAC +4	
0151	REF	645	LAST	1183	01,2755	52 183 1		DXCH	MPAC +6	
0152	REF	14	LAST	1183	01,2758	50 067 0		INDEX	NEWJOB	
0153	REF	848	LAST	1183	01,2757	52 183 1		DXCH	MPAC +8	
0154	REF	647	LAST	1183	01,2780	52 163 1		DXCH	MPAC +6	
0155	REF	241	LAST	1181	01,2781	3 4714 1		CAP	ZERO	
0156	REF	12	LAST	1182	01,2782	58 121 0		XCH	OVFIND	MAKE PUSHLOC NEGATIVE IF OVRFIND NZ.
0157					01,2783	0 0006 1		EXTEND		
0158					01,2784	1 2787 1		BZF	+3	
0159	REF	21	LAST	1182	01,2785	4 0188 1		CS	PUSHLOC	
0160	REF	22	LAST	1183	01,2766	54 166 1		TS	PUSHLOC	
0161	REF	23	LAST	1183	01,2767	52 167 0		DXCH	PUSHLOC	
0162	REF	15	LAST	1183	01,2770	50 067 0		INDEX	NEWJOB	
0163	REF	24	LAST	1183	01,2771	52 187 0		DXCH	PUSHLOC	
0164	REF	25	LAST	1183	01,2772	52 167 0		DXCH	PUSHLOC	SWAPS PUSHLOC AND PRIORITY.
0165	REF	5	LAST	1182	01,2773	3 4741 1		CAP	LOW9	SET FIXLOC TO BASE OF VAC AREA.
0166	REF	11	LAST	1182	01,2774	7 0167 0		MASK	PRIORITY	
0167	REF	35	LAST	1182	01,2775	54 120 0		TS	FIXLOC	
0168	REF	26	LAST	1183	01,2778	10 168 1		CCS	PUSHLOC	SET OVERFLOW INDICATOR ACCORDING TO
0169	REF	242	LAST	1183	01,2777	3 4714 1		CAP	ZERO	
0170	REF	1			01,3000	1 3005 0		TCF	ENDPRCHG -1	



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28,1968 SATRAP .007 PAGE 1184

L EXECUTIVE

USER=3 PAGE NO. 7 E0 S3

0171	REP	27	LAST 1183	01,3001	4 0166 1	CS	PUSHLOC
0172	REP	28	LAST 1184	01,3002	54 168 1	TS	PUSHLOC
0173	REP	141	LAST 1147	01,3003	3 4712 1	CAP	ONE
0174	REP	13	LAST 1183	01,3004	58 121 0	XCH	OVFIND
0175	REP	16	LAST 1183	01,3005	54 067 1	TS	NEWJOB
0176				01,3008	0 0003 1	ENDPROG	RELINT
0177	REP	35	LAST 1183	01,3007	52 165 1	DXCH	LOC
0178				01,3010	0 0008 1	EXTEND	
0179				01,3011	6 3013 0	BZAP	+2
0180				01,3012	52 006 0	DTCH	

BASIC JOBS HAVE POSITIVE ADDRESSES, SO
DISPATCH WITH A DTCH.
IF INTERPRETIVE, SET UP EBANK, ETC.

L EXECUTIVE

USER-S PAGE NO. 8 E0 S3

0181			01,3013	4 0000 0	COM	
0182	REF 142	LAST 1184	01,3014	6 4712 1	AD	ONE
0183	REF 36	LAST 1184	01,3015	54 184 0	TS	LOC
0186	REF 1		01,3016	1 6017 0	TCP	INTRSM

EPILOGUE TO JOB CHANGE FOR INTERPRETIVE
RESUME.

R0187 COMPLETE JOBSLEEP PREPARATIONS.

0188			01,3017	0 0004 0	JOBSLP1	INHINT
0189	REF 12	LAST 1183	01,3020	4 0167 0	CS	PRIORITY
0190	REF 13	LAST 1185	01,3021	54 167 0	TS	PRIORITY
0191	REF 8	LAST 1119	01,3022	3 6043 0	CAP	LOW7
0192	REF 23	LAST 1180	01,3023	7 0008 0	MASK	BBANK
01921			01,3024	0 0008 1	EXTEND	
01922	REF 16	LAST 1183	01,3025	04 007 1	ROR	SUPERBANK
0193	REF 12	LAST 1183	01,3026	54 165 1	TS	BANKSET
0194	REF 243	LAST 1183	01,3027	4 4714 0	CS	ZERO
0195	REF 111	LAST 1155	01,3030	54 131 0	JOBSLP2	TS BUF +1
0198	REF 1		01,3031	1 3141 1	TCP	EJSCAN

NNZ PRIORITY SHOWS JOB ASLEEP.

SAVE OLD SUPERBANK VALUE.

HOLDS - HIGHEST PRIORITY.
SCAN FOR HIGHEST PRIORITY ALA ENDJOB.

01961			01,3032	0 0004 0	NUCHANG2	INHINT
019811	REF 17	LAST 1184	01,3033	10 087 1	CCS	NEWJOB
019612			01,3034	1 3037 1	TCP	+3
019813			01,3035	0 0003 1	RELINT	
019814	REF 1		01,3036	1 3233 1	TCP	ADVAN +2

QUICK... DONT LET NEWJOB CHANGE TO +0 .

NEWJOB STILL PNZ
NEWJOB HAS CHANGED TO +0. WAKE UP JOB
VIA NUDIRECT. (VERY RARE CASE.)

01982	REF 61	LAST 1181	01,3037	3 4711 1	CAP	TWO
01983			01,3040	0 0006 1	EXTEND	
01984	REF 30	LAST 908	01,3041	05 011 1	WOR	DSALMOUT
01985	REF 37	LAST 1185	01,3042	52 185 1	DXCH	LOC
01966	REF 3	LAST 1179	01,3043	1 2733 0	TCP	CHANJOB + 4

TURN ON ACTIVITY LIGHT
AND SAVE ADDRESS INFO FOR BENEFIT OF
POSSIBLE SLEEPING JOB.

L EXECUTIVE

USER=3 PAGE NO. 9 EQ 33

TO WAKE UP A JOB, EACH CORE SET IS FOUND TO LOCATE ALL JOBS WHICH ARE ASLEEP. IF THE PCADR IN THE
LOC REGISTER OF ANY SUCH JOB MATCHES THAT SUPPLIED BY THE CALLER, THAT JOB IS AWAKENED. IF NO JOB IS FOUND,
LOCCTR IS SET TO -1 AND NO FURTHER ACTION TAKES PLACE.

0202	REP	4	LAST	1161	01,3044	54 061 1	JOBWAKE2	TS	EXECTEM1
0203	REP	244	LAST	1165	01,3045	3 4714 1	CAP		ZERO
0204	REP	13	LAST	1162	01,3046	54 064 1	TS		LOCCTR
0205	REP	2	LAST	1161	01,3047	3 2657 1	CAP		NO CORES
0206	REP	3	LAST	1162	01,3050	54 062 1	JOBWAKE4	TS	EXECTEM2
0207	REP	14	LAST	1166	01,3051	50 064 0	INDEX		LOCCTR
0208	REP	14	LAST	1165	01,3052	10 167 0	CCS		PRIORITY
0209	REP	1			01,3053	1 3056 0	TCP		JOBWAKE3
0210	REP	1			01,3054	00014 1	COREINC	DEC	12
0211	REP	1			01,3055	1 3065 0	TCP		WAKETEST
0212	REP	2	LAST	1162	01,3056	3 3054 0	JOBWAKE3	CAP	COREINC
0213	REP	15	LAST	1166	01,3057	26 064 1	ADS		LOCCTR
0214	REP	4	LAST	1166	01,3060	10 062 1	CCS		EXECTEM2
0215	REP	1			01,3061	1 3050 0	TCP		JOBWAKE4
0216	REP	143	LAST	1185	01,3062	4 4712 0	CS		ONE
0217	REP	16	LAST	1166	01,3063	54 064 1	TS		LOCCTR
0218	REP	4	LAST	1162	01,3064	1 5115 0	TCP		ENDFIND
0219	REP	6	LAST	1182	01,3065	4 0065 0	WAKETEST	CS	NEWLOC
0220	REP	17	LAST	1186	01,3066	50 064 0	INDEX		LOCCTR
0221	REP	38	LAST	1185	01,3067	6 0164 1	AD		LOC
0222					01,3070	0 0006 1	EXTEND		
0223					01,3071	1 3073 1	BZF	+2	
0224	REP	2	LAST	1166	01,3072	1 3056 0	TCP		JOBWAKE3
0225	REP	16	LAST	1166	01,3073	50 064 0	INDEX		LOCCTR
0226	REP	15	LAST	1166	01,3074	4 0167 0	CS		PRIORITY
0227	REP	9	LAST	1162	01,3075	54 063 0	TS		NEWPRIO
0228	REP	19	LAST	1166	01,3076	50 064 0	INDEX		LOCCTR
0229	REP	16	LAST	1166	01,3077	54 167 0	TS		PRIORITY
0230	REP	1			01,3100	4 4364 0	CS		FRANKMSK
0231	REP	7	LAST	1166	01,3101	7 0065 0	MASK		NEWLOC
0232	REP	3	LAST	1096	01,3102	6 4700 1	AD		2K
0233	REP	6	LAST	1166	01,3103	56 065 1	XCH		NEWLOC
0234	REP	2	LAST	1166	01,3104	7 4364 0	MASK		FRANKMSK
0235	REP	20	LAST	1166	01,3105	50 064 0	INDEX		LOCCTR
0236	REP	13	LAST	1165	01,3106	6 0165 0	AD		BANKSET
0237	REP	9	LAST	1166	01,3107	54 066 0	TS		NEWLOC +1
0238	REP	21	LAST	1166	01,3110	10 064 1	CCS		LOCCTR
0239	REP	3	LAST	1162	01,3111	1 2704 1	TCP		SETLOC
0240	REP	1			01,3112	1 2674 1	TCP		SPECTEST

BEGIN CORE SET SCAN.

ACTIVE JOB - CHECK NEXT CORE SET.
12 REGISTERS PER CORE SET.
SLEEPING JOB - SEE IF CADR MATCHES.

EXIT IF SLEEPING JOB NOT FOUND.

IF MATCH.
EXAMINE NEXT CORE SET IF NO MATCH.

RE-COMPLEMENT PRIORITY TO SHOW JOB AWAKE

MAKE UP THE 2CADR OF THE WAKE ADDRESS
USING THE CADR IN NEWLOC AND THE BRANK
HALF OF BRANK SAVED IN BANKSET.

SPECIAL TREATMENT IF THIS JOB WAS
ALREADY IN THE RUN (0) POSITION.



L. EXECUTIVE

USER-S PAGE NO. 10 E0 S3

P0241 PRIORITY CHANGE. CHANGE THE CONTENTS OF PRIORITY AND SCAN FOR THE JOB OF HIGHEST PRIORITY.

0243	REF	39	LAST	1186	01,3113	54	184	0	PRIORCH2	TS	LOC	
0244	REF	245	LAST	1186	01,3114	3	4714	1		CAP	ZERO	
0245	REF	112	LAST	1185	01,3115	54	130	1		TS	BUF	SET FLAG TO TELL ENDJOB SCANNER IF THIS
0246	REF	6	LAST	1183	01,3116	3	4741	1		CAP	LOW9	JOB IS STILL HIGHEST PRIORITY.
0247	REF	17	LAST	1186	01,3117	7	0187	0		MASK	PRIORITY	
0248	REF	10	LAST	1186	01,3120	6	0063	1		AD	NEWPRIO	
0249	REF	18	LAST	1187	01,3121	54	187	0		TS	PRIORITY	
0250					01,3122	4	0000	0		COM		
0251	REF	1			01,3123	1	3030	0		TCF	JOBSLP2	AND TO EJSCAN.



L EXECUTIVE

USER=5 PAGE NO. 11 E0 83

P0252

RELEASE THIS CORE SET AND VAC AREA AND SCAN FOR THE JOB OF HIGHEST ACTIVE PRIORITY.

0254			01,3124	0 0004 0	ENDJOB1	INHINT	
0255	REP 248	LAST 1187	01,3125	4 4714 0	CS	ZERO	
0256	REP 113	LAST 1187	01,3126	54 131 0	TS	BUF +1	
0257	REP 19	LAST 1187	01,3127	58 187 1	XCH	PRIORITY	
0258	REP 7	LAST 1187	01,3130	7 4741 0	MASK	LOW9	
02581	REP 198	LAST 1183	01,3131	54 001 1	TS	L	
02582	REP 2	LAST 1178	01,3132	4 5121 1	CS	FAKEPRET	
025821	REP 199	LAST 1188	01,3133	6 0001 0	AD	L	
02583			01,3134	0 0008 1	EXTEND		
02584	REP 2	LAST 1185	01,3135	8 3141 0	BZMP	EJSCAN	NOVAC ENDJOB
0259	REP 200	LAST 1186	01,3136	10 001 1	CCS	L	
0260	REP 328	LAST 1181	01,3137	50 000 1	INDEX	A	
0261			01,3140	54 000 0	TS	0	
0262	REP 20	LAST 1188	01,3141	10 203 1	EJSCAN	CCS	PRIORITY +12D
0263	REP 1		01,3142	0 3208 0	TC	EJ1	
0264	REP 12	LAST 1162	01,3143	0 5840 0	TC	CCSHOLE	
0265			01,3144	1 3145 0	TCP	+1	
0266	REP 21	LAST 1188	01,3145	10 217 1	CCS	PRIORITY +24D	EXAMINE EACH PRIORITY REGISTER TO FIND
0267	REP 2	LAST 1188	01,3146	0 3206 0	TC	EJ1	THE JOB OF HIGHEST ACTIVE PRIORITY.
0268	REP 13	LAST 1188	01,3147	0 5840 0	TC	CCSHOLE	
0269			01,3150	1 3151 0	TCP	+1	
0270	REP 22	LAST 1188	01,3151	10 233 1	CCS	PRIORITY +38D	
0271	REP 3	LAST 1188	01,3152	0 3208 0	TC	EJ1	
0272	REP 23	LAST 1188	01,3153	87810 1	-CCSPR	-CCS	PRIORITY
0273			01,3154	1 3155 1	TCP	+1	
0274	REP 24	LAST 1188	01,3155	10 247 1	CCS	PRIORITY +48D	
0275	REP 4	LAST 1188	01,3158	0 3208 0	TC	EJ1	
0276	REP 14	LAST 1188	01,3157	0 5640 0	TC	CCSHOLE	
0277			01,3160	1 3181 0	TCP	+1	
0278	REP 25	LAST 1188	01,3161	10 263 1	CCS	PRIORITY +60D	
0279	REP 5	LAST 1188	01,3162	0 3206 0	TC	EJ1	
0280	REP 15	LAST 1188	01,3183	0 5840 0	TC	CCSHOLE	
0261			01,3184	1 3185 1	TCP	+1	
0282	REP 26	LAST 1188	01,3165	10 277 1	CCS	PRIORITY +72D	
0283	REP 6	LAST 1188	01,3166	0 3208 0	TC	EJ1	
0264	REP 18	LAST 1188	01,3167	0 5640 0	TC	CCSHOLE	
0285			01,3170	1 3171 1	TCP	+1	



L EXECUTIVE

USER'S PAGE NO. 12 E0 83

P0286 EVALUATE THE RESULTS OF THE SCAN.

0287 REF 114 LAST 1188 01,3171 10 131 0
0288 REF 17 LAST 1188 01,3172 0 5840 0
0289 REF 16 LAST 1189 01,3173 0 5840 0

CCS BUF +1
TC CCHOLE
TC CCHOLE

SEE IF THERE ARE ANY ACTIVE JOBS WAITING

0290 REF 2 LAST 1181 01,3174 1 3176 0
0291 REF 115 LAST 1189 01,3175 1 3223 0
0292 REF 115 LAST 1189 01,3176 10 130 1
0293 REF 2 LAST 1183 01,3177 1 3201 0
0294 REF 2 LAST 1183 01,3200 1 3005 0

TCF +2
TCF DUMMYJOB
CCS BUF
TCF +2
TCF ENDPROG -1

BUF IS ZERO IF THIS IS A PRIORING AND
CHANGED PRIORITY IS STILL HIGHEST.

0295 REF 327 LAST 1188 01,3201 50 000 1
0296 REF 1 LAST 1185 01,3202 2-7777 0
0297 REF 18 LAST 1185 01,3203 6 3153 0
0298 REF 4 LAST 1185 01,3204 54 087 1
0299 REF 4 LAST 1185 01,3205 1 2725 1

INDEX A
CAP 0 -1
AD -CCSPR
TS NEWJOB
TCF CHANJOB -2

OTHERWISE, SET NEWJOB TO THE RELATIVE
ADDRESS OF THE NEW JOB'S CORE SET.

0300 REF 116 LAST 1189 01,3206 54 132 0 EJ1
0301 REF 117 LAST 1189 01,3207 6 0131 1
0302 REF 328 LAST 1189 01,3210 10 000 0
0303 REF 118 LAST 1189 01,3211 4 0132 0
0304 REF 1 LAST 1180 01,3212 1 3216 0
0305 REF 286 LAST 1180 01,3213 13 214 1
0306 REF 120 LAST 1189 01,3214 50 002 0
0307 REF 121 LAST 1189 01,3215 0 0002 0

TS BUF +2
AD BUF +1
CCS A
CS BUF +2
TCF EJ2
NCOF
INDEX 0
TC 2

- OLD HIGH PRIORITY.

NEW HIGH PRIORITY.

PROCEED WITH SEARCH.

0308 REF 119 LAST 1189 01,3216 54 131 0 EJ2
0309 REF 120 LAST 1189 01,3217 0 0008 1
0310 REF 120 LAST 1189 01,3220 22 130 0
0311 REF 121 LAST 1189 01,3221 50 130 0
0312 REF 121 LAST 1189 01,3222 0 0002 0

TS BUF +1
EXTEND
QXCH BUF
INDEX BUF
TC 2

FOR LOCATING CCS PRIORITY + X INSTR.



L EXECUTIVE

USER=3 PAGE NO. 13 E0 S3

P0314 IDLING AND COMPUTER ACTIVITY (GREEN) LIGHT MAINTENANCE. THE IDLING ROUTINE IS NOT A JOB IN ITSELF,
R0316 BUT RATHER A SUBROUTINE OF THE EXECUTIVE.

0318 REF 4 LAST 257 1361 EBANK= SELFRET SELF-CHECK STORAGE IN EBANK.
0319 REF 247 LAST 1188 01,3223 4 4714 0 DUMMYJOB CS ZERO SET NEWJOB TO -0 FOR IDLING.
0320 REF 19 LAST 1189 01,3224 54 087 1 TS NEWJOB
0321 01,3225 0 0003 1 RELINT
0322 REF 62 LAST 1185 01,3223 4 4711 0 CS TWO TURN OFF THE ACTIVITY LIGHT.
0323 01,3227 0 0008 1 EXTEND
0324 REF 31 LAST 1185 01,3230 03 011 1 WAND DSALMOUT
0328 REF 20 LAST 1190 01,3231 10 067 1 ADVAN CCS NEWJOB
0329 REF 1 01,3232 1 3032 1 TCP MUXHANG2 IS A NEWJOB ACTIVE ?
0330 REF 63 LAST 1190 01,3233 3 4711 1 CAP TWO YES... ONE REQUIRING A CHANGE JOB.
0331 REF 1 01,3234 1 3242 1 TCP MUDIRECT NEW JOB ALREADY IN POSITION FOR
EXECUTION.
03317 REF 5 LAST 1190 01,3235 3 1361 1 CA SELFRET
03318 REF 201 LAST 1188 01,3236 54 001 1 TS L PUT RETURN ADDRESS IN L.
0332 REF 1 01,3237 3 3241 0 CAP SELFBRANK
0333 REF 4 LAST 622 01,3240 1 5123 0 TCP SUPDXCHZ + 1 AND DISPATCH JOB.
03338 REF 6 LAST 1190 1361 EBANK= SELFRET
0334 REF 3 LAST 257 01,3241 68102 1 SELFBRANK BBCON SELFCHK
0335 01,3242 0 0008 1 MUDIRECT EXTEND
0336 REF 32 LAST 1190 01,3243 05 011 1 WOR DSALMOUT
0337 REF 40 LAST 1187 01,3244 52 165 1 DXCH LOC
03372 REF 5 LAST 1190 01,3245 1 5122 1 TCP SUPDXCHZ
03378 5122 BLOCK 2
03379 REF 2 LAST 1178 TO 1181* 59 59* COUNT 02/EXEC
R033791 SUPDXCHZ - ROUTINE TO TRANSFER TO SUPERBANK.
R033792 CALLING SEQUENCE
A033793 TCP SUPDXCHZ
0338 REF 202 LAST 1190 5122 56 001 0 SUPDXCHZ XCH L WITH 2CADR OF DESIRED LOCATION IN A + L.
03381 5123 0 0006 1 +1 EXTEND BASIC.
03382 REF 17 LAST 1185 5124 01 007 1 WRITE SUPERBANK
03383 REF 24 LAST 1185 5125 54 006 0 TS BRANK
03384 REF 203 LAST 1190 5126 0 0001 0 TC L
0339 5127 77677 1 NEG100 OCT 77677

L WAITLIST

USER PAGE NO. 1 E0 S3

R0001 PROGRAM DESCRIPTION
 R0003 MOD NO - 2
 R0005 MOD BY - MILLER (DTMAX INCREASED TO 162.5 SEC)
 R00072 MOD 3 BY KERNAN (INHINT INSERTED AT WAITLIST) 2/28/68 SKIPPER REV 4

DATE - 10 OCTOBER 1968
 LOG SECTION - WAITLIST
 ASSEMBLY SUNBURST REV 5

R00073 MOD 4 BY KERNAN (TWIDDLE IN 54) 3/28/68 SKIPPER REV 13.
 R000799

R0008 FUNCTIONAL DESCRIPTION-

R0009 PART OF A SECTION OF PROGRAMS, WAITLIST, TASKOVER, T3RUPT, USED TO CALL A PROGRAM, (CALLED A TASK),
 R0011 WHICH IS TO BEGIN IN C(A) CENTISECONDS. WAITLIST UPDATES TIME3, LST1 AND LST2. THE MEANING OF THESE LISTS
 R0013 FOLLOW.

R0014 $C(TIME3) = 16384 - (T1 - T)$ CENTISECONDS, (T=PRESENT TIME, T1=TIME FOR TASK1)
 R0016

R0017 $C(LST1) = -(T2 - T1) + 1$
 R0018 $C(LST1 + 1) = -(T3 - T2) + 1$
 R0019 $C(LST1 + 2) = -(T4 - T3) + 1$

R0021 $C(LST1 + 6) = -(T8 - T7) + 1$
 R0022 $C(LST1 + 7) = -(T9 - T8) + 1$
 R0023

R0024 $C(LST2) = 2CADR$ OF TASK1
 R0025 $C(LST2 + 2) = 2CADR$ OF TASK2

R0026
 R0027 $C(LST2 + 14) = 2CADR$ OF TASK6
 R0028 $C(LST2 + 16) = 2CADR$ OF TASK9
 R0029

R0030 WARNINGS-

R0031 -----
 R0032 1) $1 \pm C(A) \pm 162500$ (1 CENTISECOND TO 162.5 SEC)
 R0033 2) 9 TASKS MAXIMUM
 R0034 3) TASKS CALLED UNDER INTERRUPT INHIBITED
 R0035 4) TASKS END BY TC TASKOVER

R0036 CALLING SEQUENCE-

R0037 L-1 CA DELTAT (TIME IN CENTISECONDS TO TASK START)
 R0039 L TC WAITLIST
 R0040 L+1 2CADR DESIRED TASK
 R0041 L+2 (MINOR OF 2CADR)
 R0042 L+3 RELINT (RETURNS HERE)

R00421 TWIDDLE-

R00422 -----
 R00423 TWIDDLE IS FOR USE WHEN THE TASK BEING SET UP IS IN THE SAME BRANK AND FRANK AS THE USER. IN
 R00425 SUCH CASES, IT IMPROVES UPON WAITLIST BY ELIMINATING THE NEED FOR THE BRCON HALF OF THE 2CADR.



L WAITLIST

USER=3 PAGE NO. 2 EQ 33

R00427 SAVING A WORD. TWIDDLE IS LIKE WAITLIST IN EVERY RESPECT EXCEPT CALLING SEQUENCE, TO WIT-

R0043 L-1 CA DELTAT
R00431 L TC TWIDDLE
R00432 L+1 ADRES DESIRED TASK
R00433 L+2 RELINT (RETURNS HERE)

R00439 NORMAL EXIT MODES-

R0044 AT L+3 OF CALLING SEQUENCE

R0045 ALARM OR ABORT EXIT MODES-

R0046 TC ABORT
R0047 OCT 1203 (WAITLIST OVERFLOW - TOO MANY TASKS)

R0046 ERASABLE INITIALIZATION REQUIRED-

R0049 ACCOMPLISHED BY FRESH START, --LST2, ..., LST2 +16 =ENDTASK
R0050 LST1, ..., LST1 +7 =NEG1/2

R0051 OUTPUT--

R0052 LST1 AND LST2 UPDATED WITH NEW TASK AND ASSOCIATED TIME.
R0053 DEBRIS-

R0054 CENTRALS- A,O,L
R0055 OTHER - WAITEXIT, WAITADR, WAITTEMP, WAITBANK
R0056 DETAILED ANALYSIS OF TIMING-

R0057 CONTROL WILL NOT BE RETURNED TO THE SPECIFIED ADDRESS (ZCADR) IN EXACTLY DELTA T CENTISECONDS.
R0059 THE APPROXIMATE TIME MAY BE CALCULATED AS FOLLOWS

R0060 LET TO = THE TIME OF THE TC WAITLIST
R0061 LET TS = TO +147U + COUNTER INCREMENTS (SET UP TIME)
R0062 LET X = TS -(100TS)/100 (VARIANCE FROM COUNTERS)
R0063 LET Y = LENGTH OF TIME OF INHIBIT INTERRUPT AFTER T3RUPT
R0064 LET Z = LENGTH OF TIME TO PROCESS TASKS WHICH ARE DUE THIS T3RUPT BUT DISPATCHED EARLIER.
R0066 (Z=0, USUALLY)
R0067 LET DELTD = THE ACTUAL TIME TAKEN TO GIVE CONTROL TO ZCADR
R0068 THEN DELTD = TS+DELTA T -X +Y +Z +1.05MS* +COUNTERS*
R0069 *-THE TIME TAKEN BY WAITLIST ITSELF AND THE COUNTER TICKING DURING THIS WAITLIST TIME.
R0071

R0072 IN SHORT, THE ACTUAL TIME TO RETURN CONTROL TO A ZCADR IS AUGMENTED BY THE TIME TO SET UP THE TASK'S
R0074 INTERRUPT, ALL COUNTERS TICKING, THE T3RUPT PROCESSING TIME, THE WAITLIST PROCESSING TIME AND THE POSSIBILITY
R0076 OF OTHER TASKS INHIBITING THE INTERRUPT.
R0077

5130

BLOCK 02

L WAITLIST

USER=S PAGE NO. 3 E0 S3

```

0078 REP 14 LAST 189 E3,1400 EBANK= LST1
0079 REP 1 COUNT 02/WAIT

00795 5130 0 0004 0 TWIDDLE INHINT.
0080 REP 204 LAST 1190 5131 54 001 1 TS L
0081 REP 35 LAST 1155 5132 3 4672 0 CA POSMAX
0082 REP 287 LAST 1169 5133 26 002 1 ADS Q
0083 REP 25 LAST 1190 5134 3 0006 1 CA BBANK
00832 5135 0 0006 1 EXTEND
00834 REP 18 LAST 1190 5138 04 007 1 ROR SUPERBANK
0084 REP 205 LAST 1193 5137 56 001 0 XCH L

00849 5140 0 0004 0 WAITLIST INHINT
0085 REP 288 LAST 1193 5141 56 002 0 XCH Q
0086 REP 1 5142 54 081 1 TS WAITEXIT
0087 5143 0 0006 1 EXTEND
0088 REP 2 LAST 1193 5144 5 0061 0 INDEX WAITEXIT
0089 5145 3 0001 0 DCA 0
0090 REP 1 5146 54 063 0 -1 TS WAITADR
0091 REP 1 5147 3 5155 0 DLY2 CAP WAITBB
0092 REP 26 LAST 1193 5150 56 006 1 XCH BBANK
0093 REP 1 5151 1 3246 0 TCP WAIT2

R0094 RETURN TO CALLER AFTER TASK INSERTION
0095 REP 3 LAST 1193 5152 52 062 1 LVWTLIST DXCH WAITEXIT
0096 REP 64 LAST 1190 5153 8 4711 1 AD TWO
0097 5154 52 006 0 DTCB

0099 REP 15 LAST 1193 E3,1400 EBANK= LST1
0100 REP 2 LAST 1193 5155 02063 0 WAITBB BBON WAIT2

R0101 RETURN TO CALLER +2 AFTER WAITING DT SPECIFIED AT CALLER +1.
0102 REP 289 LAST 1193 5156 50 002 0 FIXDELAY INDEX 0
0103 5157 3 0000 1 CAP 0
0104 REP 290 LAST 1193 5160 24 002 0 INCR 0

R0105 RETURN TO CALLER +1 AFTER WAITING THE DT AS ARRIVING IN A.
0106 REP 291 LAST 1193 5161 56 002 0 VARDELAY XCH 0
0107 REP 2 LAST 1193 5162 54 063 0 TS WAITADR
0108 REP 27 LAST 1193 5163 3 0006 1 CA BBANK
0109 5164 0 0006 1 EXTEND
0110 REP 19 LAST 1193 5165 04 007 1 ROR SUPERBANK
0111 REP 206 LAST 1193 5166 54 001 1 TS L
0112 REP 1 5167 3 5172 0 CAP DELAYEX
0113 REP 4 LAST 1193 5170 54 061 1 TS WAITEXIT
0114 REP 1 5171 1 5147 1 TCP DLY2

```

TASK LISTS IN SWITCHED E BANK.

SAVE DELAY TIME IN L

CREATING OVERFLOW AND Q-1 IN Q

SAVE DELTA T IN Q AND RETURN IN WAITEXIT.

IF TWIDDLING, THE TS SKIPS TO HERE
PICK UP 2CADR OF TASK.
BBON WILL REMAIN IN L
ENTRY FROM FIXDELAY AND VARDELAY.

BOTH ROUTINES MUST BE CALLED UNDER
WAITLIST CONTROL AND TERMINATE THE TASK
IN WHICH THEY WERE CALLED.

DT TO Q. TASK ADRES TO WAITADR.

BBANK IS SAVED DURING DELAY.

ADD SBANK TO BBON.

GO TO TASKOVER AFTER TASK ENTRY.



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

20'35 OCT. 28, 1968 SATRAP .007 PAGE 1194

L WAITLIST

USER-S PAGE NO. 4 E3 S3

0115 REP 56 LAST 1059

5172 1 5211 1 DELAYEX TCP TASKOVER -2

RETURNS TO TASKOVER



L WAITLIST

USER'S PAGE NO. 5 E3 S3

R0116 ENDTASK MUST BE ENTERED IN FIXED-FIXED SO IT IS DISTINGUISHABLE BY ITS ADRES ALONE.

0118	REP	18	LAST 1193	E3,1400		EBANK= LST1		
0119	REP	1		5173	72602 0	ENDTASK -2CADR	SVCT3	
0119	REP	1		5174	73714 1			
0120	REP	18	LAST 1038	5175	10 078 1	SVCT3	CCS	FLAGWRD2
0121	REP	57	LAST 1194	5176	1 5213 0		TCP	TASKOVER
0122	REP	58	LAST 1195	5177	1 5213 0		TCP	TASKOVER
0123				5200	1 5201 0		TCP	+1
01231	REP	2	LAST 188	5201	11-322 1		CCS	IMUCADR
01232	REP	59	LAST 1195	5202	1 5213 0		TCP	TASKOVER
01233				5203	1 5208 1		TCP	+3
01234	REP	60	LAST 1195	5204	1 5213 0		TCP	TASKOVER
01235	REP	61	LAST 1195	5205	1 5213 0		TCP	TASKOVER
0124	REP	1		5208	3 7672 0	+3	CAP	PRI035
0125	REP	30	LAST 986	5207	0 5027 1		TC	NOVAC
0126	REP	7	LAST 776	E3,1480			EBANK= NBDX	
0127	REP	1		5210	03542 1		2CADR	NBDONLY
0127	REP	1		5211	14063 1			
0128	REP	62	LAST 1195	5212	1 5213 0		TCP	TASKOVER

DRIPT FLAG

DON'T DO NBDONLY IF SOMEONE ELSE IS IN IMUSTALL.

COMPENSATE FOR NBD COEFFICIENTS ONLY.
ENABLE EVERY 81.93 SECONDS

L WAITLIST

USER'S PAGE NO. 6 E3 83

P0129 BEGIN TASK INSERTION.

0130			01,3246		BANK 01		
0131	REF 1				COUNT 01/WAIT		
0132	REF 1		01,3246	54 062 1	WAIT2 TS	WAITBANK	
0133	REF 2	LAST 166	01,3247	4 0026 1	CS	TIME3	BANK OF CALLING PROGRAM.
0134	REF 27	LAST 1128	01,3250	6 4703 1	AD	BITS	
0135	REF 329	LAST 1169	01,3251	10 000 0	CCS	A	BIT 6 = OCT 200
A0136							TEST 200 - C(TIME3). IF POSITIVE,
A0137							IT MEANS THAT TIME3 OVERFLOW HAS OCCURRED PRIOR TO CS TIME3 AND THAT
A0138							C(TIME3) = T - T1, INSTEAD OF 1.0 - (T1 - T). THE FOLLOWING FOUR
							ORDERS SET C(A) = TD - T1 + 1 IN EITHER CASE.
0139	REF 2	LAST 1174	01,3252	6 6056 1	AD	OCT4000I	
0140	REF 330	LAST 1196	01,3253	4 0000 0	CS	A	OVERFLOW HAS OCCURRED. SET C(A) =
							T - T1 + 1.0 - 201
R0141	NORMAL CASE (C(A) NNZ) YIELDS SAME C(A): $-(1.0 - (T1 - T)) + 200 - 1$						
0142	REF 1		01,3254	6 3402 1	AD	OCT40201	
0143	REF 292	LAST 1193	01,3255	6 0002 0	AD	Q	RESULT = TD - T1 + 1.
0144	REF 331	LAST 1196	01,3256	10 000 0	CCS	A	TEST TD - T1 + 1
0145	REF 17	LAST 1195	01,3257	6 1400 1	AD	LST1	IF TD - T1 POS, GO TO WILST5 WITH
0146	REF 1		01,3260	1 3322 0	TCP	WILST5	C(A) = (TD - T1) + C(LST1) = TD - T2 + 1
0147			01,3261	13 282 0	NOOP		
0148	REF 293	LAST 1196	01,3262	4 0002 1	CS	Q	
R0149	NOTE THAT THIS PROGRAM SECTION IS NEVER ENTERED WHEN T-T1 G/E -1,						
R0150	SINCE TD-T1+1 = (TD-T) + (T-T1+1), AND DELTA T = TD-T G/E +1. (G/E						
R0151	SYMBOL MEANS GREATER THAN OR EQUAL TO). THUS THERE NEED BE NO CON-						
R0152	CERN OVER A PREVIOUS OR IMMINENT OVERFLOW OF TIME3 HERE.						
0153	REF 6	LAST 1057	01,3263	6 4675 1	AD	POS1/2	WHEN TD IS NEXT, FORM QUANTITY
0154	REF 9	LAST 1196	01,3264	6 4675 1	AD	POS1/2	1.0 - DELTA T = 1.0 - (TD - T)
0155	REF 3	LAST 1196	01,3265	56 026 0	XCH	TIME3	
0156	REF 12	LAST 1118	01,3266	6 4674 0	AD	NEQMAX	
0157	REF 294	LAST 1196	01,3267	6 0002 0	AD	Q	1.0 - DELTA T NOW COMPLETE.
0158			01,3270	0 0006 1	EXTEND		ZERO INDEX Q.
0159			01,3271	22 007 0	QXCH	7	(ZQ)



L WAITLIST

USER=S PAGE NO. 7 E3 S3

0160	RESP	18	LAST	1196	01,3272	57=400 1	WTLST4	XCH	LST1
0161	RESP	19	LAST	1197	01,3273	57=401 0		XCH	LST1 +1
0162	RESP	20	LAST	1197	01,3274	57=402 0		XCH	LST1 +2
0163	RESP	21	LAST	1197	01,3275	57=403 1		XCH	LST1 +3
0164	RESP	22	LAST	1197	01,3276	57=404 0		XCH	LST1 +4
0165	RESP	23	LAST	1197	01,3277	57=405 1		XCH	LST1 +5
0166	RESP	24	LAST	1197	01,3300	57=406 1		XCH	LST1 +6
0167	RESP	25	LAST	1197	01,3301	57=407 0		XCH	LST1 +7
0168	RESP	3	LAST	1193	01,3302	3 0063 1		CA	WAITADR
0169	RESP	295	LAST	1196	01,3303	50 002 0		INDEX	0
0170					01,3304	1 3305 0		TCP	+1
0171	RESP	19	LAST	187	01,3305	53=411 0		DxCH	LST2
0172	RESP	20	LAST	1197	01,3306	53=413 1		DxCH	LST2 +2
0173	RESP	21	LAST	1197	01,3307	53=415 1		DxCH	LST2 +4
0174	RESP	22	LAST	1197	01,3310	53=417 0		DxCH	LST2 +6
0175	RESP	23	LAST	1197	01,3311	53=421 0		DxCH	LST2 +8D
0176	RESP	24	LAST	1197	01,3312	53=423 1		DxCH	LST2 +10D
0177	RESP	25	LAST	1197	01,3313	53=425 1		DxCH	LST2 +12D
0178	RESP	26	LAST	1197	01,3314	53=427 0		DxCH	LST2 +14D
0179	RESP	27	LAST	1197	01,3315	53=431 1		DxCH	LST2 +16D
0180	RESP	3	LAST	187	01,3316	6 5173 1		AD	ENDTASK
A0181									
0182					01,3317	0 0006 1		EXTEND	
0183	RESP	1			01,3320	1 5152 0		BZP	LAWTLIST
0184	RESP	1			01,3321	1 3375 1		TCP	WTABORT

(MINOR PART OF TASK CADR HAS BEEN IN L.)

AT END, CHECK THAT C(LST2+10) IS STD

END ITEM, AS CHECK FOR EXCEEDING
THE LENGTH OF THE LIST.
DUMMY TASK ADRES SHOULD BE IN FIXED-
FIXED SO ITS ADRES ALONE DISTINGUISHES
IT.

L WAITLIST

USER=S PAGE NO. 8 E3 S3

0185	REP 332	LAST 1196	01,3322	10 000 0	WILST5	CCS	A
0186	REP 26	LAST 1197	01,3323	6 1401 0		AD	LST1 +1
0187			01,3324	1 3330 0		TCP	+4
0188	REP 144	LAST 1188	01,3325	6 4712 1		AD	ONE
0189	REP 1		01,3326	0 3403 0		TC	WILST2
0190			01,3327	00001 0		OCT	1
0191	REP 333	LAST 1198	01,3330	10 000 0	+4	CCS	A
0192	REP 27	LAST 1198	01,3331	6 1402 0		AD	LST1 +2
0193			01,3332	1 3338 0		TCP	+4
0194	REP 145	LAST 1198	01,3333	6 4712 1		AD	ONE
0195	REP 2	LAST 1198	01,3334	0 3403 0		TC	WILST2
0196			01,3335	00002 0		OCT	2
0197	REP 334	LAST 1198	01,3336	10 000 0	+4	CCS	A
0198	REP 28	LAST 1198	01,3337	6 1403 1		AD	LST1 +3
0199			01,3340	1 3344 0		TCP	+4
0200	REP 146	LAST 1198	01,3341	8 4712 1		AD	ONE
0201	REP 3	LAST 1198	01,3342	0 3403 0		TC	WILST2
0202			01,3343	.00003 1		OCT	3
0203	REP 335	LAST 1198	01,3344	10 000 0	+4	CCS	A
0204	REP 29	LAST 1198	01,3345	8 1404 0		AD	LST1 +4
0205			01,3346	1 3352 1		TCP	+4
0206	REP 147	LAST 1198	01,3347	8 4712 1		AD	ONE
0207	REP 4	LAST 1198	01,3350	0 3403 0		TC	WILST2
0208			01,3351	00004 0		OCT	4
0209	REP 338	LAST 1198	01,3352	10 000 0	+4	CCS	A
0210	REP 30	LAST 1198	01,3353	8 1405 1		AD	LST1 +5
0211			01,3354	1 3380 0		TCP	+4
0212	REP 148	LAST 1198	01,3355	6 4712 1		AD	ONE
0213	REP 5	LAST 1198	01,3356	0 3403 0		TC	WILST2
0214			01,3357	00005 1		OCT	5
0215	REP 337	LAST 1198	01,3360	10 000 0	+4	CCS	A
0216	REP 31	LAST 1198	01,3361	6 1406 1		AD	LST1 +6
0217			01,3362	1 3388 0		TCP	+4
0218	REP 149	LAST 1198	01,3363	6 4712 1		AD	ONE
0219	REP 6	LAST 1198	01,3364	0 3403 0		TC	WILST2
0220			01,3365	00006 1		OCT	6

TEST TD - T2 + 1

TEST TD - T3 + 1

TEST TD - T4 + 1

TEST TD - T5 + 1

TEST TD - T6 + 1

TEST TD - T7 + 1



L WAITLIST

USERS PAGE NO. 9 E3 S3

0221	RESP 338	LAST 1198	01,3386	10 000 0	+4	CCS	A
0222	RESP 32	LAST 1198	01,3387	6 1407 0		AD	LST1 +7
0223			01,3370	1 3374 0		TOP	+4
0224	RESP 150	LAST 1198	01,3371	6 4712 1		AD	ONE
0225	RESP 7	LAST 1198	01,3372	0 3403 0		TC	WTLST2
0226			01,3373	00007 0		OCT	7
0227	RESP 339	LAST 1199	01,3374	10 000 0	+4	CCS	A
0228	RESP 8	LAST 1182	01,3375	0 5604 0	WTABORT	TC	BAILOUT
0229			01,3376	01203 1		OCT	1203
0230	RESP 151	LAST 1199	01,3377	6 4712 1		AD	ONE
0231	RESP 8	LAST 1199	01,3400	0 3403 0		TC	WTLST2
0232			01,3401	00010 0		OCT	10
0233			01,3402	40201 0	OCT40201	OCT	40201

NO ROOM IN THE INN.



L WAITLIST

USER-S PAGE NO. 10 E3 S3

R0234 THE ENTRY TO WILST2 JUST PRECEDING OCT N IS FOR T LE TO LE T -1.
R0235 N N+1

R0236 (LE MEANS LESS THAN OR EQUAL TO). AT ENTRY, C(A) = -(TD - T + 1)
R0237 N+1

R0238 THE LST1 ENTRY -(T - T + 1) IS TO BE REPLACED BY -(TD - T + 1), AND
R0239 N+1 N N

R0240 THE ENTRY -(T - TD + 1) IS TO BE INSERTED IMMEDIATELY FOLLOWING.
R0241 N+1

0242	REF	1		01,3403	54 084 1	WILST2	TS	WAITTEMP
0243	REF	296	LAST 1197	01,3404	50 002 0		INDEX	0
0244				01,3405	3 0000 1		CAP	0
0245	REF	297	LAST 1200	01,3406	54 002 1		TS	0
0246	REF	152	LAST 1199	01,3407	3 4712 1		CAP	ONE
0247	REF	2	LAST 1200	01,3410	6 0064 0		AD	WAITTEMP
0248	REF	298	LAST 1200	01,3411	50 002 0		INDEX	0
0249	REF	33	LAST 1199	01,3412	27-377 1		ADS	LST1 -1
0250	REF	3	LAST 1200	01,3413	4 0064 1		CS	WAITTEMP
0251	REF	299	LAST 1200	01,3414	50 002 0		INDEX	0
0252	REF	1		01,3415	1 3272 1		TCP	WILST4

C(A) = -(TD - T + 1)

INDEX VALUE INTO 0.

C(A) = -(TD - T) + 1.
N

R0253 C(TIME3) = 1.0 - (T1 - T)

R0254 C(LST1) = - (T2 - T1) + 1

R0255 C(LST1+1) = - (T3 - T2) + 1

R0256 C(LST1+2) = - (T4 - T3) + 1

R0257 C(LST1+3) = - (T5 - T4) + 1

R0258 C(LST1+4) = - (T6 - T5) + 1

R0259 C(LST2) = 2CADR TASK1

R0260 C(LST2+2) = 2CADR TASK2

R0261 C(LST2+4) = 2CADR TASK3

R0262 C(LST2+6) = 2CADR TASK4

R0263 C(LST2+8) = 2CADR TASK5

R0264 C(LST2+10) = 2CADR TASK6



L WAITLIST

USBR=5 PAGE NO. 11

E3 S3

P0265

ENTERS HERE ON T3 RUPT TO DISPATCH WAITLISTED TASK.

0266				01,3416	0 0008 1	T3RUPT	EXTEND	
0267	REP	20	LAST 1193	01,3417	04 007 1		ROR	SUPERBANK
0268	REP	22	LAST 1088	01,3420	54 016 1		TS	BANKRUPT
0269				01,3421	0 0008 1		EXTEND	
0270	REP	18	LAST 1088	01,3422	22 012 1		QXCH	CRUPT
0271	REP	9	LAST 1170	01,3423	3 4673 1	T3RUPT2	CAP	NEG1/2
0272	REP	34	LAST 1200	01,3424	57=407 0		XCH	LST1 +7
0273	REP	35	LAST 1201	01,3425	57=408 1		XCH	LST1 +6
0274	REP	38	LAST 1201	01,3426	57=405 1		XCH	LST1 +5
0275	REP	37	LAST 1201	01,3427	57=404 0		XCH	LST1 +4
0276	REP	38	LAST 1201	01,3430	57=403 1		XCH	LST1 +3
0277	REP	39	LAST 1201	01,3431	57=402 0		XCH	LST1 +2
0278	REP	40	LAST 1201	01,3432	57=401 0		XCH	LST1 +1
0279	REP	41	LAST 1201	01,3433	57=400 1		XCH	LST1
0280	REP	36	LAST 1193	01,3434	6 4672 0		AD	POS MAX
0281	REP	4	LAST 1196	01,3435	26 026 1		ADS	TIME3
0282	REP	3	LAST 577	01,3436	54 734 0		TS	RUPTAGN
0283	REP	246	LAST 1190	01,3437	4 4714 0		CS	ZERO
0284	REP	4	LAST 1201	01,3440	54 734 0		TS	RUPTAGN
0285				01,3441	0 0008 1		EXTEND	
0286	REP	4	LAST 1197	01,3442	4 5174 1		DCS	ENDTASK
0287	REP	26	LAST 1197	01,3443	53=431 1		DXCH	LST2 +16D
0288	REP	29	LAST 1201	01,3444	53=427 0		DXCH	LST2 +14D
0289	REP	30	LAST 1201	01,3445	53=425 1		DXCH	LST2 +12D
0290	REP	31	LAST 1201	01,3446	53=423 1		DXCH	LST2 +10D
0291	REP	32	LAST 1201	01,3447	53=421 0		DXCH	LST2 +8D
0292	REP	33	LAST 1201	01,3450	53=417 0		DXCH	LST2 +6
0293	REP	34	LAST 1201	01,3451	53=415 1		DXCH	LST2 +4
0294	REP	35	LAST 1201	01,3452	53=413 1		DXCH	LST2 +2
0295	REP	36	LAST 1201	01,3453	53=411 0		DXCH	LST2
0296	REP	207	LAST 1193	01,3454	58 001 0		XCH	L
0297				01,3455	0 0008 1		EXTEND	
0298	REP	21	LAST 1201	01,3456	01 007 1		WRITE	SUPERBANK
0299	REP	208	LAST 1201	01,3457	58 001 0		XCH	L
0300				01,3460	52 008 0		DCH	

READ CURRENT SUPERBANK VALUE AND
SAVE WITH E AND F BANK VALUES.

DISPATCH WAITLIST TASK.

1. MOVE UP LST1 CONTENTS, ENTERING
A VALUE OF 1/2 +1 AT THE BOTTOM
FOR T8-T5, CORRESPONDING TO THE
INTERVAL 61.91 SEC FOR ENDTASK.
2. SET T3 = 1.0 - T2 -T USING LIST 1.
SO T3 WONT TICK DURING UPDATE.

SETS RUPTAGN TO +1 ON OVERFLOW.

DISPATCH TASK.

SET SUPERBANK FROM BRCN OF 2CADR
RESTORE TO L FOR DXCH Z.



L WAITLIST

USER=3 PAGE NO. 12 E3 S3

P0301 RETURN, AFTER EXECUTION OF T3 OVERFLOW TASK'

0302				5213				BLOCK	02
0303	REP	2	LAST 1193 TO 1196'	51	51*			COUNT	02/WAIT
0304	REP	5	LAST 1201	5213	10 734 0	TASKOVER	CCS	RUPTAGN	
0305	REP	2	LAST 1193	5214	3 5155 0		CAP	WAITBB	
0306	REP	28	LAST 1193	5215	54 008 0		TS	BBANK	
0307	REP	1		5216	1 3423 0		TCP	T3RUPT2	
0308	REP	23	LAST 1201	5217	3 0016 0		CA	BANKRUPT	
0309				5220	0 0006 1		EXTEND		
0310	REP	22	LAST 1201	5221	01 007 1		WRITE	SUPERBANK	
0311				5222	0 0006 1	RESUME	EXTEND		
0312	REP	19	LAST 1201	5223	22 012 1		QXCH	QRUPT	
0313	REP	24	LAST 1202	5224	3 0016 0	NOQRSM	CA	BANKRUPT	
0314	REP	29	LAST 1202	5225	56 006 1		XCH	BBANK	
0315	REP	11	LAST 128	5226	52 011 0	NOQBRSM	DXCH	ARUPT	
03155				5227	0 0003 1		RELINT		
0316				5230	5 0017 1		RESUME		

IF +1 RETURN TO T3RUPT, IF -0 RESUME.

DISPATCH NEXT TASK IF IT WAS DUE.

RESTORE SUPERBANK BEFORE RESUME IS DONE

L WAITLIST

USER=S PAGE NO. 13 E3 53

P0317 LONGCALL

R0318 PROGRAM DESCRIPTION
R0319 PROGRAM WRITTEN BY W.H. VANDEVER
R0320 MOD BY- R. MELANSON TO ADD DOCUMENTATION

DATE- 17 MARCH 1987
LOG SECTION WAITLIST
ASSEMBLY SUNDISK REV. 100

R0321 FUNCTIONAL DESCRIPTION-
R0322 LONGCALL IS CALLED WITH THE DELTA TIME ARRIVING IN A,L SCALED AS TIME2,TIME1 WITH THE 2CADR OF THE TASK
R0324 IMMEDIATELY FOLLOWING THE TC LONGCALL. FOR EXAMPLE, IT MIGHT BE DONE AS FOLLOWS WHERE TIMELOC IS THE NAME OF
R0328 A DP REGISTER CONTAINING A DELTA TIME AND WHERE TASKDO IS THE NAME OF THE LOCATION AT WHICH LONGCALL IS TO
R0328 START

R0329 CALLING SEQUENCE-

A0330
A0331
A0332
A0333

EXTEND
DCA TIMELOC
TC LONGCALL
2CADR TASKDO

R0334 NORMAL EXIT MODE-

R0335 1). TC WAITLIST
R0338 2). DTCB (TO L+3 OF CALLING ROUTINE 1ST PASS THRU LONGCYCL)
R0337 3). DTCB (TO TASKOVER ON SUBSEQUENT PASSES THRU LONGCYCL)

R0338 ALARM OR ABORT EXIT MODE-

R0339 NONE

R0340 OUTPUT-

R0341 LONGTIME AND LONGTIME+1 = DELTA TIME
R0342 LONGEXIT AND LONGEXIT+1 = RETURN 2CADR
R0343 LONGCADR AND LONGCADR+1 = TASK 2CADR
R0344 A = SINGLE PRECISION TIME FOR WAITLIST

R0345 ERASABLE INITIALIZATION-

R0348 A = MOST SIGNIFICANT PART OF DELTA TIME
R0347 L = LEAST SIGNIFICANT PART OF DELTA TIME
R0348 Q = ADDRESS OF 2CADR TASK VALUE

R0349 DEBRIS-

R0350 A,Q,L
R0351 LONGCADR AND LONGCADR+1
R0352 LONGEXIT AND LONGEXIT+1
R0353 LONGTIME AND LONGTIME+1

R0354 *** THE FOLLOWING IS TO BE IN FIXED-FIXED AND UNSWITCHED ERASABLE ***

0355		5231		BLOCK 02	
0356	REF 42 LAST 1201	E3,1400		ERANK= LST1	
0357	REF 1	5231	53=140 1	LONGCALL DXCH LONGTIME	OBTAIN THE DELTA TIME
0358		5232	0 0006 1	EXTEND	OBTAIN THE 2CADR



L WAITLIST

USER=8 PAGE NO. 14 E3 83

0350 REP 300 LAST 1200 5233 5 0002 0 NOX Q
0360 5234 3 0001 0 DCA 0
0361 REP 1 5235 53=134 1 DXCH LONGCADR

0362 5236 0 0006 1 EXTEND
0363 REP 1 5237 3 5242 0 DCA LOCL2CDR
0364 5240 52 006 0 DTCH

NOW GO TO THE APPROPRIATE SWITCHED BANK
FOR THE REST OF LONGCALL

0365 REP 43 LAST 1203 E3,1400 EBANK= LST1
0366 REP 1 5241 03461 1 LOCL2CDR 2CADR LONGCALL2
0366 REP 1 5242 02063 0

R0367 *** THE FOLLOWING MAY BE IN A SWITCHED BANK, INCLUDING ITS ERASABLE ***

0366 01,3461 BANK 01
0369 REP 2 LAST 1196 TO 1202' 139 139* COUNT 01/WAIT
0370 REP 1 01,3461 23=435 1 LONGCALL2 LXCH LONGEXIT +1
0371 REP 65 LAST 1193 01,3462 3 4711 1 CA TWO
0372 REP 301 LAST 1204 01,3463 28 002 1 ADS Q
0373 REP 2 LAST 1204 01,3464 55=434 1 TS LONGEXIT

SAVE THE CORRECT BB FOR RETURN
OBTAIN THE RETURN ADDRESS

R0374 *** WAITLIST TASK LONGCYCL ***

0375 01,3465 0 0008 1 LONGCYCL EXTEND
0376 REP 1 01,3466 4 3477 1 DCS DPBIT14
0377 REP 2 LAST 1203 01,3467 21=140 1 DAS LONGTIME
0378 REP 3 LAST 1204 01,3470 11=140 1 CCS LONGTIME +1
0379 REP 1 01,3471 1 3510 1 TCP MUCHTIME

CAN WE SUCCESSFULLY TAKE ABOUT 1.25
MINUTES OFF OF LONGTIMEA0380
A0381
A0382
A0383
A0384

0385 01,3472 13 473 0 NOOP
0386 01,3473 1 3474 1 TCP +1
0387 REP 4 LAST 1204 01,3474 11=137 1 CCS LONGTIME
0388 REP 2 LAST 1204 01,3475 1 3510 1 TCP MUCHTIME
0389 01,3476 00000 1 DPBIT14 OCT 00000
0390 01,3477 20000 0 OCT 20000

THE REASONING BEHIND THIS PART IS
INVOLVED, TAKING INTO ACCOUNT THAT THE
WORDS MAY NOT BE SIGNED CORRECTED (DP
BASIC INSTRUCTIONS
DO NOT SIGN CORRECT) AND THAT WE SUBTRAC
TED BIT14 (1 OVER HALF THE POS. VALUE
REPRESENTABLE IN SINGLE WORD)
CAN'T GET HERE *****

A0391

0392 REP 71 LAST 1174 01,3500 3 4875 1 LASTTIME CA BIT14
0393 REP 5 LAST 1204 01,3501 27=140 1 ADS LONGTIME +1
0395 REP 50 LAST 1058 01,3502 0 5140 1 TC WAITLIST
0396 REP 44 LAST 1204 E3,1400 EBANK= LST1
0397 REP 1 01,3503 03515 0 2CADR GETCADR
0397 REP 1 01,3504 02063 0

LONGCALL
GET BACK THE CORRECT DELTA TFOR WAITLIST

THE ENTRY TO OUR LONGCADR

0399 REP 1 01,3505 3 3517 1 LONGRTN CA TSKOVCDR

SET IT UP SO THAT ONLY THE FIRST EXIT IS



L WAITLIST

USER'S PAGE NO. 15 E3 S3

0400	REP	3	LAST 1204	01,3506	53=435 0	DXCH	LONGEXIT
0401				01,3507	52 006 0	DTCH	
0402	REP	72	LAST 1204	01,3510	3 4675 1	MUCHTIME	CA BIT14
0404	REP	51	LAST 1204	01,3511	0 5140 1	TC	WAITLIST
0405	REP	45	LAST 1204	E3,1400		EBANK=	LST1
0406	REP	1		01,3512	03465 0	ZCADR	LONGCYCL
0406	REP	1		01,3513	02063 0		
0408	REP	1		01,3514	1 3505 0	TCF	LONGTRN
R0409			*** WAITLIST TASK	GETCADR ***			
0410	REP	2	LAST 1204	01,3515	53=134 1	GETCADR	DXCH LONGCADR
0411				01,3516	52 006 0	DTCH	
0412	REP	63	LAST 1195	01,3517	05213 1	TSKOVCDR	GENADR TASKOVER

TO THE CALLER OF LONGCALL
THE REST ARE TO TASKOVERWE HAVE OVER OUR ABOUT 1.25 MINUTES
SO SET UP FOR ANOTHER CYCLE THROUGH HERE

NOW EXIT PROPERLY

GET THE LONGCALL THAT WE WISHED TO START
AND TRANSFER CONTROL TO IT

L LATITUDE LONGITUDE SUBROUTINES

R0001 SUBROUTINE TO CONVERT RAD VECTOR AT GIVEN TIME TO LAT, LONG AND ALT

R0002 CALLING SEQUENCE

R0003 L-1 CALL

R0004 L LAT-LONG

R0005 SUBROUTINES USED

R0006 R-TO-RP, ARCTAN, SETGAMMA, SETRE

R0007 ERASABLE INIT. REQ.

R0008 AX0, -AY0, AZ0, TEMPH (SET AT LAUNCH TIME)

R0009 ALPHAV = POSITION VECTOR METERS B-29

R0010 MPAC = TIME (CSECS B-28)

R0011 ERADFLAG = 1, TO COMPUTE EARTH RADIUS, = 0 FOR FIXED EARTH RADIUS

R0012 LUNAPLAG = 0 FOR EARTH, 1 FOR MOON

R0013 OUTPUT

R0014 LATITUDE IN LAT (REVS. B-0)

R0015 LONGITUDE IN LONG (REVS. B-0)

R0016 ALTITUDE IN ALT METERS B-29

0017 30, 3776

0018 REP 1 13, 2000

0019 13, 2322

0020 REP 1

0021 REP 19 LAST 894 E4, 1551

0022 13, 2322 40220 0

0023 REP 1 13, 2323 02242 1

0024 13, 2324 00001 0

0025 13, 2325 24007 0

0026 REP 20 LAST 1206 13, 2326 02152 0

0027 13, 2327 51406 1

0028 REP 2 LAST 68 13, 2330 16310 1

0029 REP 6 LAST 1176 13, 2331 11456 0

0030 13, 2332 71414 0

0031 REP 24 LAST 694 13, 2333 01743 0

0032 REP 1 13, 2334 26335 0

0033 13, 2335 77624 1

0034 REP 3 LAST 599 13, 2336 55366 1

0035 13, 2337 77656 1

0036 REP 21 LAST 1206 13, 2340 36152 1

0037 REP 1 13, 2341 26523 1

0038 13, 2342 77624 1

0039 REP 2 LAST 592 13, 2343 26533 0

0040 13, 2344 63545 0

0041 REP 22 LAST 1206 13, 2345 02152 0

0042 13, 2346 63525 0

0043 REP 23 LAST 1206 13, 2347 02154 0

BANK 30
SETLOC LATLONG
BANK

COUNT 13/LT-LG

EBANK= ALPHAV
LAT-LONG STO SETPD
INCORPEX

STOVL 6D
ALPHAV

PUSH ABVAL
STOVL ALPHAM
ZEROVEC

BOFF COS
LUNAPLAG
CALLRTRP

CALLRTRP CALL
R-TO-RP

UNIT
STCALL ALPHAV
SETGAMMA

CALL
SETRE
DLOAD DSO
ALPHAV
PDDL DSO
ALPHAV +2

SAVE TIME IN 6-7D FOR R-TO-RP

0-5D= R FOR R-TO-RP
ABS. VALUE OF R FOR ALT FORMULA BELOW
SET MPAC=0 FOR EARTH, NON-ZERO FOR MOON
USE COS(0) TO GET NON-ZERO IN MPAC
0=EARTH, 1=MOON

RP VECTOR CONVERTED FROM R B-29
UNIT RP B-1
U2= 1/2 SINL FOR SETRE SUBR BELOW
SET GAMMA=B2/A2 FOR EARTH, =1 FOR MOON
SCALED B-1
CALC RE METERS B-29



L LATITUDE LONGITUDE SUBROUTINES

USER'S PAGE NO. 2 E4 S3

0044				13,2350	75415 0
0045				13,2351	76405 1
0046	REF	1		13,2352	00011 1
0047	REF	5	LAST 838	13,2353	14021 1
0048	REF	24	LAST 1206	13,2354	02156 1
0049	REF	5	LAST 838	13,2355	34023 1
0050	REF	1		13,2356	26463 1
0051	REF	14	LAST 690	13,2357	15104 0
0052	REF	25	LAST 1207	13,2360	02152 0
0053	REF	6	LAST 1207	13,2361	14021 1
0054	REF	26	LAST 1207	13,2362	02154 0
0055	REF	6	LAST 1207	13,2363	34023 1
0056	REF	2	LAST 1207	13,2364	26463 1
0057	REF	10	LAST 889	13,2365	15106 1
0058	REF	3	LAST 1206	13,2366	02310 1
0059				13,2367	77625 0
0060	REF	7	LAST 764	13,2370	02241 1
0061	REF	7	LAST 634	13,2371	35110 1
0062	REF	2	LAST 1206	13,2372	02242 1

DAD	SCOT	
DMP	SL1R	
	GAMRP	
STOOL	COSIH	COS(LAT) B-1
	ALPHAV +4	
STCALL	SINTH	SIN(LAT) B-1
	ARCTAN	
STOOL	LAT	LAT B0
	ALPHAV	
STOOL	COSIH	COS(LONG) B-1
	ALPHAV +2	
STCALL	SINTH	SIN(LONG) B-1
	ARCTAN	
STOOL	LONG	LONG. REVS B-0 IN RANGE -1/2 TO 1/2
	ALPHAM	
DSU		ALT= R-RE METERS B-29
	ERADM	
STCALL	ALT	EXIT WITH ALT METERS B-29
	INCORPEX	



L LATITUDE LONGITUDE SUBROUTINES

USER-S PAGE NO. 3 E4 S3

P0063 SUBROUTINE TO CONVERT LAT, LONG, ALT AT GIVEN TIME TO RADIUS VECTOR
P0064 CALLING SEQUENCE

R0065 L-1 CALL
R0066 L LALOTRV
R0067 SUBROUTINES USED

R0068 SETGAMMA, SETRE, RP-TO-R
R0069 ERASABLE INIT. REQ.

R0070 AXO, AYO, AZO, TERHEM SET AT LAUNCH TIME
R0071 LAT-- LATITUDE (REVS B0)
R0072 LONG-- LONGITUDE (REVS B0)
R0073 ALT-- ALTITUDE (METERS) B-29
R0074 MPAC-- TIME (CSECS B-28)
R0075 ERADFLAG=1 TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0076 LUNAPLAG=0 FOR EARTH, 1 FOR MOON
R0077 OUTPUT

R0078 R-VECTOR IN ALPHAV (METERS B-29)

0079			13,2373	40220 0	LALOTRV STO	SETPD
0080	REP 3	LAST 1207	13,2374	02242 1		INCORPEX
0081			13,2375	00001 0		OD
0082			13,2376	34007 1	STCALL	GD
0083	REP 2	LAST 1206	13,2377	28523 1		SETGAMMA
0084			13,2400	73545 1	DLOAD	SIN
0085	REP 15	LAST 1207	13,2401	01104 0		LAT
0086			13,2402	65275 1	DMPR	PDDL
0087	REP 2	LAST 1207	13,2403	00011 1		GAMRP
0088	REP 16	LAST 1208	13,2404	01104 0		LAT
0089			13,2405	65346 0	COS	PDDL
0090	REP 11	LAST 1207	13,2406	01106 1		LONG
0091			13,2407	57356 0	SIN	DMPR
0092			13,2410	71525 0	PDDL	COS
0093	REP 17	LAST 1208	13,2411	01104 0		LAT
0094			13,2412	71525 0	PDDL	COS
0095	REP 12	LAST 1208	13,2413	01106 1		LONG
0096			13,2414	55475 1	DMPR	VDEF
0097			13,2415	41456 0	UNIT	PUSH
0098	REP 27	LAST 1207	13,2416	36152 1	STCALL	ALPHAV
0099	REP 3	LAST 1206	13,2417	28533 0		SETRE
0100			13,2420	43145 0	DLOAD	BOFF
0101	REP 7	LAST 1206	13,2421	11456 0		ZEROVEC
0102	REP 25	LAST 1208	13,2422	01743 0		LUNAPLAG
0103	REP 1		13,2423	26425 0		CALLRPRT
0104			13,2424	77746 1	COS	
0105			13,2425	77624 1	CALLRPRT CALL	
0106	REP 7	LAST 894	13,2426	55341 1		RP-TO-R
0107	REP 28	LAST 1208	13,2427	16152 0	STOXL	ALPHAV
0108	REP 8	LAST 1207	13,2430	02241 1		ERADM

LAT, LONG, ALT TO R VECTOR

6-7D= TIME FOR RP-TO-R
GAMMA=B2/A2 FOR EARTH, 1 FOR MOON B-1
COS(LONG)COS(LAT) IN MPAC
UNIT RP= SIN(LONG)COS(LAT) 2-3D
PD 2 GAMMA*SIN(LAT) 0-1D

0-1D= GAMMA*SIN(LAT) B-2
PD 4 2-3D=COS(LAT) B-1 TEMPORARILY

PD 2
PD 4 2-3D=SIN(LONG)COS(LAT) B-2

PD 6 4-5D=COS(LAT) B-1 TEMPORARILY

PD 4 MPAC= COS(LONG)COS(LAT) B-2
0-5D= UNIT RP FOR RP-TO-R SURF.
ALPHAV +4= SIN(LONG)COS(LAT) SURF.
RE METERS B-29
SET MPAC=0 FOR EARTH, NON-ZERO FOR MOON

USE COS(0) TO GET NON-ZERO IN MPAC

EXIT WITH UNIT R VECTOR IN MPAC



L LATITUDE LONGITUDE SUBROUTINES

USER-S PAGE NO. 4 E4 S3

0109 13,2431 74215 1
0110 REF 8 LAST 1207 13,2432 01110 0
0111 REF 29 LAST 1208 13,2433 02152 0
0112 13,2434 77772 0
0113 REF 30 LAST 1209 13,2435 38152 1
0114 REF 4 LAST 1208 13,2436 02242 1
R0115 SUBROUTINE TO COMPUTE EARTH RADIUS

DAD VXSC
ALT
ALPHAV
VSL1
STCALL ALPHAV
INCORPEX

(RE + ALT)(UNIT R) METERS B-30

R METERS B-29

EXIT WITH R IN METERS B-29

R0116 INPUT

R0117 1/2 SIN LAT IN ALPHAV +4

R0118 OUTPUT

R0119 EARTH RADIUS IN ERADM AND MPAC (METERS B-29)

0120 13,2437 63545 0
0121 REF 31 LAST 1209 13,2440 02156 1
0122 13,2441 44352 0
0123 REF 1 13,2442 11454 1
0124 13,2443 44275 1
0125 REF 1 13,2444 28460 1
0126 REF 2 LAST 1209 13,2445 11454 1
0127 13,2446 75465 1
0128 REF 1 13,2447 28454 0
0129 13,2450 77622 1
0130 REF 9 LAST 1208 13,2451 02241 1
0131 13,2452 77618 0

GETERAD DLOAD DSQ
SL1 B0SU
DMPR B0SU
BDDV DP1/2
SR4R B2XSC
STORE ERADM
RVQ

SIN**2(L)

COS**2(L)

R01311 THE FOLLOWING CONSTANTS WERE COMPUTED WITH A=6376166, B=6356784 METERS

R01312 B2XSC= B**2 SCALED B-51

R01313 B2/A2= B**2/A**2 SCALED B-1

R01314 B2=(1-B**2/A**2) SCALED B-0

0132 13,2453 00448 1
0132 13,2454 00305 1
0133 REF 4 LAST 1176 04,3453
0134 13,2455 17711 0
0134 13,2456 05254 1
0135 13,2457 00155 0
0135 13,2460 25250 1
0136 13,2461 00302 0
0136 13,2462 17755 0

B2XSC 2DEC .0179450689 B**2 SCALED B-51
DP1/2 = XUNIT
B2/A2 2DEC .9933084684 B-1 GAMMA= B**2/A**2 B-1
EE 2DEC 6.6935116 E-3 (1-B**2/A**2) B-0
ERAD 2DEC 6373338 B-29 PAD RADIUS

L LATITUDE LONGITUDE SUBROUTINES

USER=5 PAGE NO. 5 E4 S3

P0137 ARCTAN SUBROUTINE
R0138 CALLING SEQUENCE

R0139 SIN THETA IN SINTH B-1
R0140 COS THETA IN COSTH B-1
R0141 CALL ARCTAN

R0142 OUTPUT

R0143 ARCTAN THETA IN MPAC AND THETA B-0 IN RANGE -1/2 TO +1/2

0144			13,2463	77600 1	ARCTAN	BOV	
0145	REP	1	13,2464	28465 1			CLROVPLW
0146			13,2465	63545 0	CLROVPLW	DLOAD	DSO
0147	REP	7 LAST 1207	13,2466	00023 0			SINTH
0148			13,2467	63525 0			DSO
0149	REP	7 LAST 1207	13,2470	00021 1			COSTH
0150			13,2471	77615 0			
0151			13,2472	75454 0			
0152	REP	1	13,2473	28511 0			
0153			13,2474	40065 0			
0154	REP	8 LAST 1210	13,2475	00023 0			
0155	REP	1	13,2476	28516 1			
0156			13,2477	67542 0			
0157	REP	4 LAST 715	13,2500	00025 0			
0158			13,2501	50125 1			
0159	REP	8 LAST 1210	13,2502	00021 1			
0160	REP	1	13,2503	28505 0			
0161			13,2504	43545 1			
0162			13,2505	57545 1			
0163			13,2506	43244 1			
0164	REP	1	13,2507	28513 1			
0165	REP	3 LAST 1209	13,2510	11454 1			
0166	REP	5 LAST 1210	13,2511	00025 0			
0167			13,2512	77616 0			
0168			13,2513	52025 1			
0169	REP	4 LAST 1210	13,2514	11454 1			
0170	REP	2 LAST 1210	13,2515	26511 0			
0171			13,2516	75345 1			
0172	REP	1	13,2517	11502 0			
0173	REP	9 LAST 1210	13,2520	00023 0			
0174	REP	6 LAST 1210	13,2521	00025 0			
0175			13,2522	77616 0			
0176	REP	2 LAST 706	04,3455				

ATAN=0/0 SET THETA=0

2DZERO = DPZERO



L LATITUDE LONGITUDE SUBROUTINES

USER-S PAGE NO. 6 E4 53

P0177 SETGAMMA SUBROUTINE
R0178 SUBROUTINE TO SET GAMMA FOR THE LAT-LONG AND LATOTRV SUBROUTINES

R0179 GAMMA = B**2/A**2 FOR EARTH (B-1)
R0180 GAMMA = 1 FOR MOON (B-1)

R0181 CALLING SEQUENCE
R0182 L CALL
R0183 L+1 SETGAMMA

R0184 INPUT
R0185 LUNAPLAG=0 FOR EARTH,=1 FOR MOON

R0186 OUTPUT
R0187 GAMMA IN GAMRP (B-1)

0188			13,2523	43145 0	SETGAMMA DLOAD	B0FF	BRANCH FOR EARTH
0189	REF	1	13,2524	28456 1		B2/A2	EARTH GAMMA
0190	REF	28	13,2525	01743 0		LUNAPLAG	
0191	REF	1	13,2526	28531 1		SETGMEX	
0192			13,2527	77735 0	SLOAD		
0193	REF	1	13,2530	11454 1		1B1	MOON GAMMA
0194	REF	3	13,2531	00011 1	SETGMEX STORE	GAMRP	
0195			13,2532	77616 0	RVD		
0196			0010		GAMRP =	8D	



L LATITUDE LONGITUDE SUBROUTINES

USER=3 PAGE NO. 7 E4 S3

P0197SETRE SUBROUTINE

R0198 SUBROUTINE TO SET RE (EARTH OR MOON RADIUS)

R0199 RE= RM FOR MOON

R0200 RE= RREF FOR FIXED EARTH RADIUS OR COMPUTED RP FOR FISCHER ELLIPSOID

R0201 CALLING SEQUENCE

R0202 L CALL

R0203 L+1 SETRE

R0204 SUBROUTINES USED

R0205 GETERAD

R0206 INPUT

R0207 ERADFLAG=0 FOR FIXED RE, 1 FOR COMPUTED RE

R0208 ALPHAV +4= 1/2 SINL IF GETERAD IS CALLED

R0209 LUNAFAG=0 FOR EARTH,=1 FOR MOON

R0210 OUTPUT

R0211 ERADM= 504RM FOR MOON (METERS B-29)

R0212 ERADM= ERAD OR COMPUTED RP FOR EARTH (METERS B-29)

0213			13,2533	71220 II	SETRE	STO	DLOAD	
0214	REP	1	13,2534	00051 0			SETREX	
0215	REP	1	13,2535	26560 0			504RM	
0216			13,2536	71214 0		BON	DLOAD	BRANCH FOR MOON
0217	REP	27	13,2537	01703 II			LUNAFAG	
0218	REP	1	13,2540	26550 0			TSTRLSRM	
0219	REP	1	13,2541	26462 0			ERAD	
0220			13,2542	45014 0		BOFF	CALL	ERADFLAG=0 FOR FIXED RE, 1 FOR COMPUTED
0221	REP	14	13,2543	00742 0			ERADFLAG	
0222	REP	1	13,2544	26546 II			SETROX	
0223	REP	4	13,2545	26437 0			GETERAD	
0224	REP	10	13,2546	36241 0	SETROX	STCALL	ERADM	EXIT WITH RE OR RM METERS B-29
0225	REP	2	13,2547	00051 0			SETREX	
0226			13,2550	77214 0	TSTRLSRM	BON	VLOAD	ERADFLAG=0, SET R0=RLS
0227	REP	15	13,2551	00702 II			ERADFLAG	=1 R0=RM
0228	REP	2	13,2552	26546 II			SETROX	
0229	REP	9	13,2553	02026 II			RLS	
0230			13,2554	64446 0		ABVAL	SR2R	SCALE FROM B-27 TO B-29
0231			13,2555	77650 II		GOTO		
0232	REP	3	13,2556	26546 II			SETROX	
0233	REP	12	0051		SETREX	=	S2	
0234			13,2557	00055 II	504RM	2DEC	1738090 B-29	METERS B-29 (MOON RADIUS)
0234			13,2560	01265 II				